Ocean Health Index Strategic Plan

Eva Schemmel, Conservation International Hawaiʻi, eschemmel@conservation.org

Summary

Conservation International Hawaiʻi is partnering with the National Oceanic and Atmospheric Administration Integrated Ecosystem Assessment team to better understand Hawaiʻi’s ocean health. We are working with stakeholders and ocean managers to develop the Ocean Health Index for the main Hawaiian Islands and West Hawaiʻi.

Background

The Ocean Health Index is the first integrated assessment framework that scientifically combines key biological, physical, economic, and social elements of the ocean’s health. Overall Index scores are a combination of ten components, or ‘goals’, of ocean health. These scores are calculated using the best available data and indicators at the scale of the assessment. Scores reflect how well coastal regions optimize their potential ocean benefits and services in a *sustainable way relative to a reference point* (target), on a scale of 0-100.

Methods for calculating the Ocean Health Index were developed at a global scale, combining dozens of data sets to produce annual Index scores for coastal nations and territories. As a result, for the first time, we are able to assess and compare global performance in managing our relationship with the Earth’s greatest resource—the Ocean. The global business community celebrated this accomplishment when the World Economic Forum recognized the Index as one of two innovative ocean solutions on June 8th, 2013.

Using the same framework, independent assessments (OHI+) allow for exploration of variables influencing ocean health at the smaller scales where policy and management decisions are made. Targets for goals are created using stakeholder input, higher resolution data, indicators, and priorities, which produce scores that better reflect local priorities. This enables communities, managers, policy makers, scientists to better and more holistically understand, track, and communicate the status of local marine ecosystems, and to design strategic management actions to improve overall ocean health.

Objectives

1. **Build a coalition for sustainable ocean management:** The process of defining management targets as reference points and weighting goals according to local priorities requires collaboration among coastal stakeholders, natural resource managers, scientific experts, and communities. We will embed the Hawai‘i OHI+ into the West Hawaiʻi Integrated Ecological Assessment initiative, leveraging existing partnerships that NOAA and other stakeholders have developed in the region. Further, in developing the Index and enabling its uptake in policy spheres, we will work collaboratively with the Hawai‘i Green Growth (HGG) initiative, a multi-sector partnership of leaders from private and public entities that was formed in 2011 to develop Hawai‘i’s green economy.
2. **Use objective scientific data to inform decision-making:** Data at a regional scale are often more precise and informative than global or national-scale data. For example, in an OHI assessment of the U.S. West Coast, the resulting scores were much more accurate than the broader score for the entire U.S., and therefore more helpful for informing policy in the region.
3. **Test management scenarios and assess trade-offs:**  Because the Index promotes optimal use of ocean resources in a sustainable way, increases in tourism are perceived as a positive. Thus, a scaled study can quantify how different management actions impact scores. For example, we can quantitatively assess the impact of hotel development on local economies, employment, and artisanal fishing opportunities. Likewise, the Ocean Health Index can contribute to determine the potential tradeoffs between improving the score of any one goal, including tourism and recreation, versus the impact on scores for other goals such as biodiversity, water quality, and coastal protection as a basis for decision-making. We can also use the Ocean Health Index to identify which pressures are negatively affecting the overall status of the ocean and of specific goals and which resilience measures are effective at counteracting the effect of those pressures.
4. **Monitor performance through time using a repeatable, user-friendly tool:** The Hawai‘i OHI+ assessment can be updated regularly as new data become available, allowing us to assess progress and development trends over time. As new information becomes available, decision-makers and stakeholders are able to implement adaptive management measures, making the most effective use of resources as the ocean and coastal zone continues to evolve.

Outcomes

To build a scientifically robust index of ocean health for Hawaiʻi that is supported by local stakeholders and integrated into ongoing policy initiatives to support sustainable ocean management. We will work within the OHI framework to allow for repeatable assessments of the index goals overtime allowing for progress toward a common vision for a healthy ocean and sustainable ocean management.

Assessment Locations

The Hawaiʻi OHI+ will use the scientifically robust framework of the Ocean Health Index at the scale of the Hawaiian archipelago. We will focus our development of the Hawaiʻi Ocean Health Index at two scales:

1. The West Hawaiʻi region; and
2. Statewide, for coastal waters.

The Hawaiʻi statewide assessment which will focus on the Main Hawaiian Islands and will be at the island scale. Regions will be Hawaiʻi, Maui, Molokai, Lanai, Oahu, and Kauai. The island scale is used to designate districts of Hawaiʻi, which are used in policy and management for the State of Hawaiʻi.

To produce the spatial boundaries of these reporting units we use the Hawaiʻi USA Exclusive Economic Zones (EEZ). A nearshore spatial scale is computed as the offshore 3nm boundary for Hawaiʻi islands to be used in some goals. The OHI focus is on the entire EEZ, however, some goals are assessed on the nearshore (3 nm scale).

|  |  |  |
| --- | --- | --- |
| **Goal** | **Sub-Goal** | **Primary Scale of Goal** |
| Food Provision | Fisheries | EEZ |
| Mariculture | Nearshore |
| Artisanal Fishing Opportunities |  | Nearshore |
| Natural Products |  | EEZ |
| Coastal Protection |  | Nearshore |
| Tourism & Livelihoods |  | EEZ |
| Tourism |  | nearshore |
| Recreation |  | nearshore |
| Sense of Place |  | nearshore |
| Clean Waters |  | nearshore |
| Biodiversity | Species | EEZ |
| Habitats | EEZ |

Process: Adapting the Ocean Health Index for Hawaiʻi

The process of developing and adapting the OHI at two scales (West Hawaiʻi and Hawaiʻi) is extremely important for creating a culturally, socially, and ecologically appropriate tool for measuring ocean health in Hawaiʻi. The Ocean Health Index is being adapted for with the support of local experts, stakeholder surveys, advisory group, workshops and community meetings and integration with ongoing initiatives. We are also in the process of developing a communication platform (website) for the development of the Ocean Health Index to be able to better communicate with all stakeholders and the public.

*Surveys:* Surveys for the OHI were sent to multiple agencies, private sectors, NGO’s, community and cultural representatives, and scientists and academics. These surveys were sent one month before each workshop. The objectives of the surveys were to gather stakeholder input on the definition of ocean health for Hawaiʻi, list of the benefits that they receive from the ocean and list the priorities and needs that the OHI would support, and begin defining OHI goals in a Hawai’i context. These surveys were used as a guide for the OHI framework and to support discussions at each workshop.

*Workshops:* Multiple workshops are being held to adapt the OHI global framework to meet the regional needs. Included participants are from multiple agencies, NGOs, communities, universities, and private organizations. The first workshops took place in Honolulu on August, 2016 and Kailua-Kona on December 2, 2016. The objectives of these workshops were to define a clear vision of ocean health and adapt the OHI goals to reflect Hawaiʻiʻs and West Hawaiʻiʻs assessment and management needs. The workshop goals included:

* Define ocean health for Hawaiʻi: Stakeholder definitions of ocean health were assessed through pre-workshop surveys and reviewed in each of the workshops to bring multiple stakeholder groups and participants to a clear vision of ocean health for Hawaiʻi.
* Build a coalition for sustainable ocean management: This project is bringing together management agencies, stakeholders, and organizations to support sustainable ocean management through a clear vision of ocean health and a united common goal of assessing and tracking ocean health in Hawaiʻi.
* Build conceptual framework: The OHI goals were drafted to meet Hawaiʻi’s unique ecological, social, economic, and cultural aspects. The workshops focused on defining each goal as it related to Hawaiʻi, determining indicators, and identifying references for each goal.

These workshops resulted in a draft framework for the West Hawaiʻi Ocean Health Index and the Hawaiʻi (statewide) Ocean Health Index. The goal models developed were very similar for both assessment scales and therefore a joint framework is being proposed. The difference between the two assessments will be the data that is available at each scale.

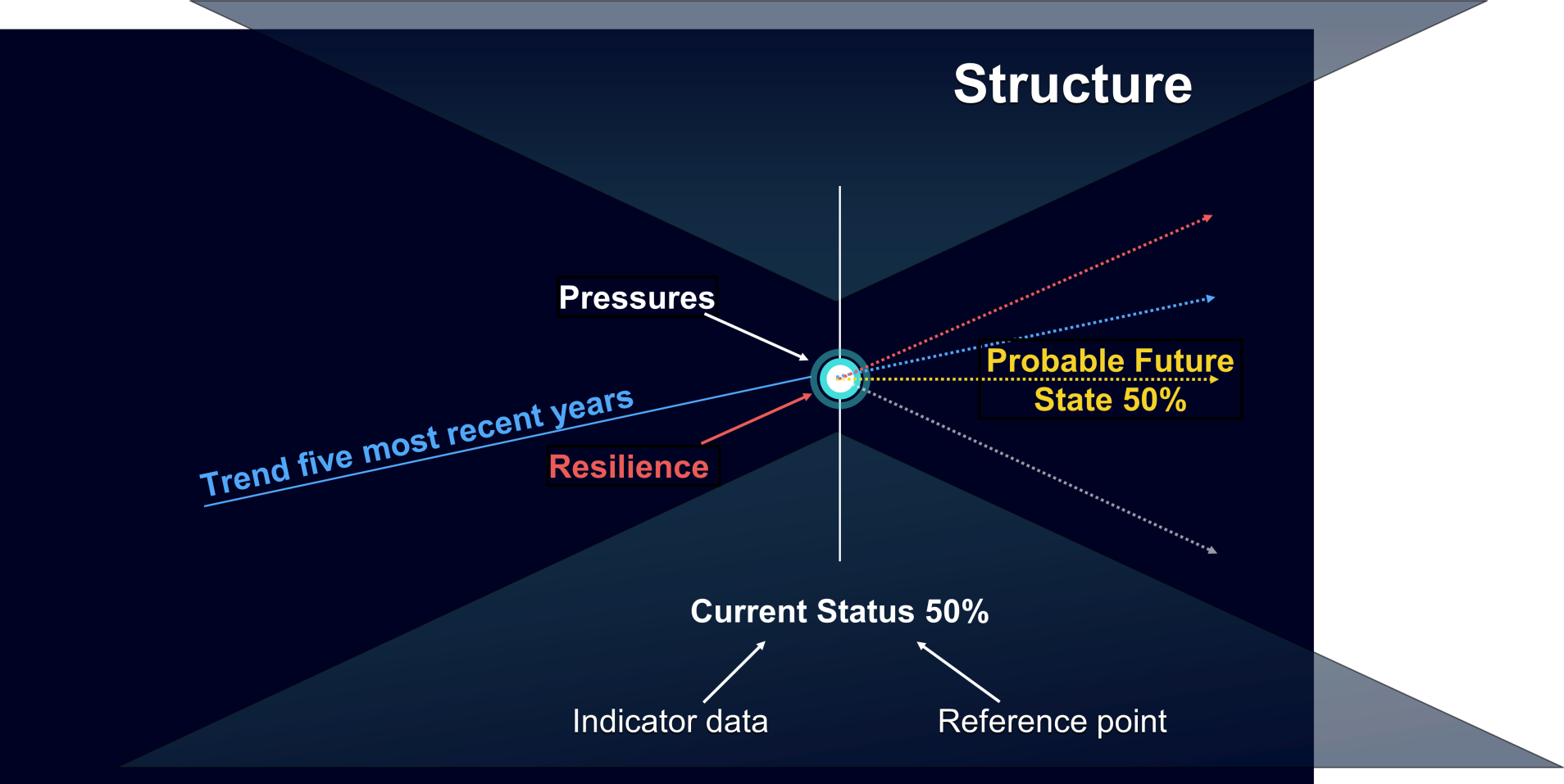
*Advisory Group:* The development and utilization of the Hawaiʻi Ocean Health Index will also be supported through an advisory board of key private, community, and government officials. The advisory board will be respected members of each sector and will likely include members of Hawaiian Airlines, the State Department of Land and Natural Resources, cultural and community advisors, State Office of Planning, government officials, and the National Oceanic and Atmospheric Administration. The role members of the advisory group are to represent the interests of their stakeholders for the development and use of the OHI. Advisors will serve as a two-way information exchange with their interest groups and constituencies.

*Synergies with Existing Regional and Statewide Ocean Sustainability Initiatives:* Conservation International is partnering with ongoing initiatives throughout Hawaiʻi to support incorporation of these initiatives into the OHI and form a coalition for ocean sustainability. The Hawai‘i Ocean Health Index will be fully embedded into the West Hawaiʻi Integrated Ecosystem Assessment (IEA) initiative and also take advantage of other regional ocean sustainability initiatives in the West Hawaiʻi region, including NOAA’s West Hawai‘i focus area for the Habitat Blueprint project, the West Hawai‘i Fishery Management Council, and participating communities in the E Alu Pū network facilitated by Kuaʻāina Ulu ʻAuamo (KUA). These partnerships allow us to reach multiple agencies and community groups throughout West Hawaiʻi.

At the state level, the Hawai‘i Ocean Health Index will also include and inform state metrics and a public dashboard developed by the State Office of Planning and Hawai‘i Green Growth (HGG) to indicate progress toward the *Aloha+ Challenge* targets. The *Aloha+ Challenge* is a joint leadership commitment to sustainability for the State of Hawai‘i that was launched by Hawai‘i’s Governor, its four mayors, and the Office of Hawaiian Affairs in July 2014. The *Aloha+ Challenge* sets six statewide sustainability targets to be achieved by 2030 – in clean energy transformation, local food production, natural resource management, solid waste reduction (discarded resource recovery), smart growth, climate resilience, green job creation, and education. The purpose of these targets is to provide a shared framework to set priorities, take action, and track progress toward a more sustainable and resilient Hawai‘i. The will inform the development of a framework and metrics for the *Smart Sustainable Communities and Economies* target and will leverage key relationships with private sector leaders that are partners of CI Hawaiʻi and HGG, increasing the reach and impact of this project.

Conceptual Framework

Ocean Health is defined as an ocean that can provide benefits and services for people now and into the future. Furthermore, health was defined as a state of being that is pono (sustainable/respectful); where functions and processes can exist, perpetuate, and evolve, including the presence and role of humans. Our common vision for ocean health in Hawaiʻi is a resilient and productive system that provides services and resources to sustain Hawaiʻi Island residents and economy perpetually into the future. To achieve this vision several measures were suggested that included: getting control of shoreline development and its impacts, reducing land-based pollution sources, feral cat control, sustainable fishing practices, invasive species management, healthy tourism and visitor education focused on sustainable use and conservation, and incorporation of traditional Hawaiian resource management practices and values.



Caption: The framework to assess ocean health index goal scores includes the current status (50% of the goal score) and probable future state (50% of the goal score). The current status is calculated using available indicators in relation to a stakeholder set reference point. The probable future status measures the cumulative pressures (negative impacts on a goal score), cumulative resilience (positive impacts on a goal score) and trend (projected goal status in five years).

*Goal Specific Models*

The global Ocean Health Index developed 10 goals that encompass ocean health: Food Provision, Natural Products, Clean Water, Coastal Protection, Carbon Storage, Biodiversity, Tourism & Recreation, Livelihoods & Economies, Artisanal Fishing Opportunities, and Sense of Place. These goals for the OHI were adapted from the global framework and the ten goals for the Hawaiʻi OHI are Food Provision, Natural Products, Clean Water, Coastal Protection, Biodiversity, Economies & Livelihoods (Tourism & Livelihoods), Recreation, Artisanal Fishing Opportunities, and Sense of Place. The Carbon Storage goal is tabled for now as it is seen as lacking the necessary information such as extend of seagrasses and carbon storage capacity. Additionally mangroves are present in Hawaiʻi but are invasive and there is not a consensus on whether to include mangroves for this goal. The West Hawaiʻi and statewide OHI goal models are currently the same but may diverge as the assessment process moves forward with stakeholder and managing agency input.

*Food Provision*

*Wild Caught Fisheries:* Measures the amount of wild-caught seafood (pelagic, bottom, and nearshore fishes) that can be sustainably harvested. Data gaps are recognized such as the lack of stock assessments for many harvested species. Additionally, traditional stock assessments do not take ecosystem impacts into account and ecosystem models are preferred if and when they are developed for West Hawaiʻi.

|  |  |  |
| --- | --- | --- |
| Indicators | Data & Sources | Reference Points |
| Yield (lbs of each species) | DAR | Used to weight B/BMSY score |
| Single species biomass (B) at maximum sustainable yield (BMSY) for pelagic and bottom fish fisheries | NOAA Stock Assessment (tuna, swordfish, and bottom fish species) | B/BMSY = ranging from 0.8-1.2 |
|  |  |  |
| Spawner potential ratio (SPR) for reef fish | NOAA Reef Fish Stock Assessments (10-12 species) | SPR>0.4 (40%) |

*Mariculture:* Measures the sustainable production potential (fishponds) and current production of seafood weighted by a sustainability/risk score (use of non-native species and the % of feed imported).

|  |  |  |
| --- | --- | --- |
| Indicators | Data & Sources | Reference Points |
| Fishponds-# active and undergoing restoration | Loko ia and OHA | Not developed yet |
| lbs produced or number of producers (includes offshore aquaculture & any food cultured for commercial sale) | Department of Agriculture/DBEDT | Not developed yet. |
|  |  |  |
| Sustainability/risk: % of native vs non-native species produced, % of feed imported vs produced locally | Department of Agriculture | Not developed yet |

*Natural Products:* This goal measures the sustainable harvest of ocean-derived resources for purposes other than direct consumption. Resources under this goal include salt, shells, medicinal products and aquarium fish. The goal will be measured as the commercial value (revenue) and/or cultural or medicinal value of products weighted by a risk/sustainability score that will be developed for each species assessed.

|  |  |  |
| --- | --- | --- |
| Indicators | Data & Sources | Reference Points |
| Yield (lbs harvested) or # of permits | DBEDT, DAR (coral, algae, etc. permits) | Not developed yet |
| cultural or medicinal value of products |  | Not developed yet |
|  |  |  |
| risk/sustainability score will depend on species | DAR | Not developed yet |
|  |  |  |

*Livelihoods & Economies (Tourism & Livelihoods):* Most livelihoods in Hawaiʻi can be linked directly or indirectly to tourism. This goal aims to measure the benefits that tourism provides while taking into account the integrity of the culture of Hawaiʻi and the protection of the natural environment, i.e. sustainable tourism.

|  |  |  |
| --- | --- | --- |
| Indicators | Data & Sources | Reference Points |
| % of tax revenues from tourism that goes to environmental protection | HTA |  |
| Fresh water resources | Aquafer levels? | Fresh water is limited in West Hawaiʻi and sets a carrying capacity on tourism |
| wages/livable wage per sector | State data book DBEDT | Discussions through Hawaiʻi Green Growth Smart Sustainable Communities will help inform this goal and target reference points. |
| # of jobs per sector | State data book DBEDT | Land an boat-based tourism - |
|  |  |  |
| revenue per sector | State data book DBEDT | Reference should use net revenue – impacts to natural capital |

*Recreation: This goal measures the* opportunities for residents to enjoy coastal areas through recreation measured through access to beaches and coastal areas and number of participants in recreational activities.

|  |  |  |
| --- | --- | --- |
| Indicators | Data & Sources | Reference Points |
| Access to ocean and coastal areas | Office of Planning | Spatial or temporal reference |
| number of participants in recreational activities – i.e. camping permits, boating permits, etc | Ocean Use Atlas | Not developed yet |
|  |  |  |

*Coastal Protection*: This goal measures the natural protection of coastal habitats measured as the extent and condition of beaches/sand dunes, coral reefs, wetlands that provide coastal protection from inundation and erosion. The target for wetlands is no net loss of wetlands and/or number of acres effectively managed. The target for beaches/sand dunes will be a temporal reference to the historical extent. The condition for coral reefs will be measured through percent coral cover and/or the ratio of cacifiers to non-calcifiers. Goal also could include other indicators of coastal protective ability including intertidal area, slope and rugosity of the nearshore environment, and the ratio of coastal development to the natural environment.

|  |  |  |
| --- | --- | --- |
| Indicators | Data & Sources | Reference Points |
| Wetlands: No net loss of wetlands or # of acres effectively managed | USAGE/NWI/NHDH/CCAP | Not developed yet |
| Beaches/Sand Dunes: extent/condition | OCCL, SOEST, Sea Grant | percent of historical extent |
|  |  |  |
| Coral Reefs: % coral cover and/or ratio of cacifiers to non-calcifiers | NOAA CREP, DAR | Not developed yet: The reference state for the condition of coral reef habitat is known. Some reefs have naturally lower coral cover. Discussions are ongoing to choose a reference point. |
| Rugosity | DAR, NOAA |  |
| Reef Slope | NOAA |  |
| Intertidal area | COH |  |
| Ratio of coastal development to natural environment/changes in coastal zoning | COH |  |

*Clean Water*: This goal measures the degree to which local waters are unpolluted by natural and human made causes including five pollutants: sediment, nutrients, pathogens, trash/marine debris, and chemicals. Groundwater is the major source of nutrient, chemical, and pathogens entering the marine environment in West Hawaiʻi.

|  |  |  |
| --- | --- | --- |
| Indicators | Data & Sources | Reference Points |
| sediment: brown water days or turbidity | DOH/TNC/USGS/NOAA | DOH and EPA standards    DOH and EPA standards  DOH and EPA standards  DOH and EPA standards |
| nutrients: groundwater nutrient input comparted to EPA standard | USGS, DOH, NPS, Sea Grant, UH Hilo |
|  |  |
| chemicals: chemical input compared to EPA standard  pathogens: zero beach closures and/or levels that do not exceed closure levels  Trash  Clean Water Act 303D-# of water bodies impaired  Vegetation cover: % of native vegetation cover in watersheds | USGS, DOH, NPS, Sea Grant, UH Hilo  # of cesspools & locations as proxy  marine debris map - DAR/NOAA, trash removed (surf rider, 808 clean ups, sustainable coastlines)  DOH |

*Biodiversity*

*Habitats:* The habitats sub-goal of biodiversity measures the extent, condition, and level of management protection of coastal and terrestrial habitats. Habitats include coral reefs, wetlands, anchialine ponds, pelagic water column, beaches, fishponds, and watersheds.

|  |  |  |
| --- | --- | --- |
| Indicators | Data & Sources | Reference Points |
| Coral Reefs: coral cover, macroalgae cover, cca cover, ratio of calcifiers to non calcifiers  Beaches/sand dunes | NOAA\_CREP  OCCL/ SOEST/SEAGRANT | Discussions are ongoing to choose condition metrics and reference points.  Ungulate controlled areas |
| Wetlands: No net loss of wetlands or # of acres effectively managed | USAGE/NWI/NHDH/CCAP |
|  |  |
| Alkaline ponds  30% of marine and terrestrial areas protected  Intertidal  Fishponds  Pelagic water column  Groundwater flow could be a resilience for biodiversity or direct indicator.  Incidence of animal (coral) disease could be a pressure for biodiversity or direct indicator. | National Park Service  DLNR  KUA  NOAA – IEA  NOAA, DAR, NPS, UH Hilo |

*Species:* This sub-goal of biodiversity measures the population status of species including biodiversity (species richness), abundance, percent endemism, and risk of extinction (from IUCN red list classifications).

|  |  |  |
| --- | --- | --- |
| Indicators | Data & Sources | Reference Points |
| Reef fish biomass - pristine reef fish biomass  Species Richness of corals, algae (limu), and fish  Percent of endemism  IUCN red list status- cetaceans and turtles | NOAA\_CREP  NOAA\_CREP  NOAA\_CREP  IUCN & local population assessments from NOAA & DAR | Not yet developed |

*Artisanal Fishing Opportunities:* This goal measures the opportunity for fishers to supply seafood for themselves, families, and community.

|  |  |  |
| --- | --- | --- |
| Indicators | Data & Sources | Reference Points |
| #/biomass of harvested reef fish to pristine biomass ratio | NOAA CREP | Not developed yet |
| #/biomass of pelagic fish | NOAA | This data is not specific to West Hawaiʻi as these fish are highly migratory |
| # of fishers  coastal development | NOAA phone survey, MRIP  Office of Planning | Not developed yet  Not developed yet |
|  |  |  |
| shoreline access | Office of Planning | Not developed yet |

*Sense of Place:* The past, present, and future connection between people and place.

|  |  |  |
| --- | --- | --- |
| Indicators | Data & Sources | Reference Points |
| Place names | OHA | Not developed yet |
| Inventory of wahi pana sites (sacred sites) | OHA, historic preservation inventory, DOT arch survey, IEA mapping activity, civil engineering maps, community records | Henry Kekahuna maps (coastline 1940s) |
| Stewardship programs: # of activities/ events/ people engaged in particular regions | KUA, communities | Not developed yet |
|  |  |  |
|  |  |  |

Timeline

Throughout the project:

Objective: Build a coalition for sustainable ocean management.

Tasks:

* January 2016 – June 2017. Meet with working groups (P2P, HGG, SSC)
* Meet with experts to understand potential goal models for Hawaiʻi and data available March 2016 – June 2017
* January 2017– March 2017. Develop advisory group (DLNR, Office of Planning, Hawaii Tourism Authority, OHA, Hawaiian Airlines) and have a short (1hr) introductory meeting to OHI, each other, and role in Hawaiʻi OHI+.
* July 2016 – December 2016.Create survey to focus workshop attendees and gather preliminary information
  + Send OHI Hawaii fact sheet (1-pager) and FAQ and OHI overview
  + What are key issues facing ocean health and management in Hawaiʻi?
  + What characteristics are most important to capture in our assessment?
  + What known information should be included in our assessment?
  + What are the desired outcomes for the Hawaiʻi OHI+?
* January2017 – July 2019. Stakeholder engagement in West Hawaii. Meet with communities in West Hawaii. Meet with industry leaders, ecotourism operators, and charter fisheries.

July 2016 –March 2017

Objective: Use objective scientific data to inform decision-making through tailoring the OHI to meet Hawaiʻiʻs stakeholder and cultural needs, and identify available data and data gaps.

Tasks:

* Two expert workshops, one in Honolulu (August 1-2, 2016) and one in West Hawaii (December 2, 2016).
* Set goal models and reference targets.
* Incorporate ongoing initiatives through advisory group and the State Office of Planning.

March 2017 – July 2017

Objective: Summarize survey and workshop information and communicate adapted OHI to working groups and stakeholders.

Tasks:

* Summarize workshop outputs and send out to participants for review.
* Communicate HawaiʻI OHI+ framework and conceptual changes in the index to stakeholders and advisory group.

March 2017 – July 2017

Objective: Gather the data needed to develop the statewide Ocean Health index.

Tasks:

* Meet with experts for each goal to gather data, revise goal models, and address any data filling methodologies.
* Work with spatial analyst to gather and develop spatial data.

July - December 2017

Objective: Develop statewide Ocean Health Index and work with OHI toolkit

Tasks:

* Develop goal models in OHI toolkit for Hawaii
* Develop pressure and resilience matrix
* Work with spatial analyst to register data layers and create all metadata.

January 2018

Objective: Communicate the results through working groups, formal presentations, and formal report (publication).

Tasks:

* Make all documents available in web application for communication of Hawaiʻi OHI+ (Documents and code will also be available on GitHub).
* Write publication

.

February 2018 – July 2019

Objective: Develop the West Hawaiʻi Ocean Health Index

* Utilized stakeholder engagement, surveys, outreach results to develop the West Hawaii OHI indicators
* Develop goal models in OHI toolkit for West Hawaii
* Develop pressure and resilience matrix
* Work with spatial analyst to register data layers and create all metadata.
* Hold large public event to share the results of the stakeholder derived West Hawaii Ocean health Index

Additional Information on the Ocean Health Index

www.oceanhealthindex.org

www.ohi-science.org

Glossary

**DAR:** Department of Land and Natural Resources Division of Aquatic Resources

**DOH:** Department of Health

**EPA:** Environmental Protection Agency

**Goal:** A measure of the benefits that the ocean provides. There are ten goals for the index: Food Provision, Subsistence Fishing Opportunities, Natural Products, Coastal Protection, Tourism & Livelihoods, Clean Waters, Biodiversity, and Sense of Place. Each goal has a score per region representing the current status and its likely future state.

**HTA**: Hawaiʻi Tourism Authority

**Indicator:** Data that is available for each goal and used in a mathematic model to evaluate the status for each goal to a reference point. The goal status is likely to be a combination of many indicators.

**OCCL**: Department of Land and Natural Resources Office of Conservation and Coastal Lands

**NOAA:** National Ocean and Atmospheric Administration

**NOAA CREP:** National Ocean and Atmospheric Administration Coral Reef Ecosystem Program

**NPS:** National Park Service

**Pressures:** Stressors or impacts that negatively affect a goal. Pressures can be ecological and/or social pressures.

**Resilience:** The social, institutional, and ecological factors that positively affect a goal.

**Status:** The current value of a goal relative to its reference point.

**TNC:** The Nature Conservancy

**UH Hilo:** University of Hawaiʻi Hilo

**USGS:** United States Geological Survey