2014 FIJI
ASSESSMENT CASE STUDY
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**WHAT IS THE OCEAN HEALTH INDEX?**

The Ocean Health Index scientifically compares and combines key elements from all dimensions of the ocean’s health - biological, physical, economic and social - to measure how sustainably people are using the ocean. Using the definition, “A healthy ocean sustainably delivers a range of benefits to people now and in the future,” the Index assesses and tracks a portfolio of ten goals (shown in Table 1) that people have for a healthy ocean and their associated benefits.

The goals reflect what people expect from a healthy ocean with scores capturing how well coastal regions maximize a sustainable long-term flow of those benefits to people. The score is the average of present Status (the most recent value) and the Likely Future Status (the probable change in Status during the coming 5 years) as shown in Table 2.

Each goal is assessed on a scale from 0 to 100. A score of 100 means that the evaluated system has achieved its defined target (reference point) for that goal, and therefore is sustainably delivering all of the specified benefits, and is likely to continue doing so in the near future. A score of ‘0’ means that none of the available benefits were gained or that they were obtained in an unsustainable manner. A region’s score is the average of its goal scores.

Goals not applicable to a region are not calculated or averaged. Global assessments measure the marine conditions of every coastal nation, allowing for a country-to-country comparison. The Index can be used at nearly all geographic scales from global to local.

<table>
<thead>
<tr>
<th>Goal</th>
<th>Sub-goal</th>
<th>Benefit measured</th>
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<tr>
<td><strong>FOOD PROVISION</strong></td>
<td>Fisheries</td>
<td>Seafood sustainably harvested for human consumption from wild, or cultured stocks</td>
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<td></td>
<td>Mariculture</td>
<td></td>
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<tr>
<td><strong>ARTISANAL FISHING OPPORTUNITY</strong></td>
<td></td>
<td>Opportunity to engage in artisanal fishing as a social, cultural and livelihood activity</td>
</tr>
<tr>
<td><strong>NATURAL PRODUCTS</strong></td>
<td></td>
<td>Amount of sustainably harvested natural products (other than for food provision)</td>
</tr>
<tr>
<td><strong>CARBON STORAGE</strong></td>
<td></td>
<td>Conservation of coastal habitats affording carbon storage and sequestration</td>
</tr>
<tr>
<td><strong>COASTAL PROTECTION</strong></td>
<td></td>
<td>Conservation of coastal habitats affording protection from inundation and erosion</td>
</tr>
<tr>
<td><strong>TOURISM &amp; RECREATION</strong></td>
<td></td>
<td>Opportunity to enjoy coastal areas for recreation for locals and tourists</td>
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<tr>
<td><strong>COASTAL LIVELIHOODS &amp; ECONOMIES</strong></td>
<td>Livelihoods</td>
<td>Employment (livelihoods) and revenues (economies) from marine-related sectors</td>
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<td></td>
<td>Economies</td>
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<tr>
<td><strong>SENSE OF PLACE</strong></td>
<td>Iconic species</td>
<td>Sense of place and cultural connectedness to the ocean afforded by lasting special places and iconic species</td>
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<td></td>
<td>Lasting special places</td>
<td></td>
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<tr>
<td><strong>CLEAN WATERS</strong></td>
<td></td>
<td>Clean waters that are free of pollution, debris and safe to swim in</td>
</tr>
<tr>
<td><strong>BIODIVERSITY</strong></td>
<td>Habitats</td>
<td>Conservation of biodiversity of species and habitats for their existence value</td>
</tr>
<tr>
<td></td>
<td>Species</td>
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*Figure 1. Ocean Health Index goals and the associated benefits that are measured.*
While methods for calculating the Ocean Health Index were developed at a global scale, using the same framework, regional assessments allow for exploration of factors that influence ocean health at the smaller scales where policy and management decisions are made. Goal models and targets are created using higher resolution data, indicators and priorities, which produce scores that better reflect local realities. This enables scientists, managers, policy makers and the public 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.

Results are specific to the region studied and are not comparable to global results or other regional assessments. An assessment was recently completed for Fiji.

The Fiji assessment was done as the final in a series of three case studies conducted by the Ocean Health Index. These three studies were completed as a way to assess the feasibility and effectiveness of conducting assessments on a smaller scale, in three very different conditions: data rich (U.S. West coast), varying management styles within one country (Brazil) and low data (Fiji). These assessments have provided enough scientific underpinnings for the creation of the OHI+ platform.
ABOUT THIS STUDY

Fiji is an oceanic archipelago comprising 332 islands (106 of them inhabited) spread over 194,000 sq. km of the southwest Pacific Ocean. About 75% of Fiji’s land area is on its two main islands, Vivu Levu and Vanua Levu, which together contain nearly 85% of the nation’s current population of about 875,000.

As a country at the center of Oceania, Fiji is highly dependent on the ocean for many things, including food and income. Fish makes up an important part of the local diet and frozen fish is an important export product. Marine-related tourism plays a key role in the economy. About 75% of visitors come for Fiji’s scenic white beaches and to snorkel or scuba dive among its beautiful coral reefs.

Consequently, maintainance and promotion of ocean health may perhaps have more central importance for Fiji than for many other countries.

In this study, five of the Index’s ten goals were recalculated either through incorporation of local data, construction of more suitable reference points or podification of methods so that results were more relevant to Fiji. Those changes and their results are shown in Figure 3. Comparing results from the two studies helps to illustrate how regional applications of the Index may differ from global ones and highlights what can be learned from doing regional studies.
Figure 3: Summary of Ocean Health Index scores for Fiji from the (A) case study analysis using new data and goal models and (B) global 2013 analysis. The darker the blue, the higher the score. The outer ring is the maximum possible score for each goal and the goal’s score and weight (relative contribution) are represented by the petal’s length and width, respectively, except for the food provision sub-goals which are weighted by relative actual yield when calculating the goal score even though the petals are equal width. In Fiji’s case, virtually zero mariculture yield means that the food provision score is equal to the fisheries sub-goal score.
GOAL 1: FOOD PROVISION

This goal measures the amount of seafood captured or raised in a sustainable way. Food Provision is divided into two sub-goals: Wild-caught commercial seafood and Mariculture or ocean-farmed seafood.

The score for Food production is the yield-weighted mean of the subgoal scores for Fisheries and Mariculture. Even though the mariculture score is 0, the mariculture yield is so low that it receives almost no weight for goal score calculation. Thus the Food Provision score is the same as the Fisheries score.

Wild-caught Fisheries

The amount of wild-caught seafood that is sustainably caught within Fiji’s waters was measured with the same method used in the global study, using the reference point that for each stock fished, the population biomass (B) should be within ± 5% of the Biomass that can deliver maximum sustainable yield (B_{MSY}). The same ‘catch-MSY’ method was used along with the same global data provided by the UN Food and Agriculture Organization and Sea Around Us project for each taxa caught in Fiji waters. As in the global study, overfished taxa were penalized twice as heavily as underfished stocks. In the global study any taxa caught that were not identified to the species leve were penalized, because poor taxonomic identification suggests that management is not adequate. Fiji’s fishery, like most tropical fisheries relies on a diverse community of species, and catches are frequently classified only at the family level. Therefore catches reported at the species, genus or family level were not penalized. Penalties were levied on catches reported at coarser taxonomic levels, though in slightly different ways than in the global study. The net result was a score of 90, compared to Fiji’s global score of 87.

Mariculture

This subgoal, which assess the sustainability and productivity of mariculture, was measured in the same way as for the global study and used some of the same data. However, local data from the Fiji Department of Fisheries were used for giant tiger prawn (Penaeus monodon) and blue shrimp (Litopenaeus stylirostris). These new data did not change the score, which remained 0 as it was in the global study. The reason for the low score is that Fiji’s overall production is so small compared to the global reference point, which is the status of mariculture in the 95th percentile of all the countries reporting mariculture in the 2013 global study.
GOAL 2: ARTISANAL FISHING OPPORTUNITIES

This goal measures whether people who need to fish on a small, local scale have the opportunity to do so. The concept of ‘opportunity’ has two parts: (1) physical access to the coast; and (2) availability of fish to catch. In the global study the reference point was that everyone who needed to fish artisanally could do so. Need was estimated using a financial measure, but at the global level the availability of fish to catch could not be measured. The net result is that the Artisinal Opportunity goal scored 92 compared to 46 in the global study.

Fiji’s situation is very different because everyone has access to subsistence fishing as long as they use permissible gear, so the only important factor is whether fish are available to catch. Fish availability was measured using the same data and models as for the fisheries subgoal, but only using information on taxa that are fished artisanally. For each of those taxa availability was calculated based on the whole catch, not just how much was caught artisanally.
GOAL 3: NATURAL PRODUCTS

This goal measures how sustainably people harvest non-food, living products from the sea. Marine natural products can provide substantial economic benefits when sustainably harvested and traded.

For each of the six products related to the Natural Products goal, the reference point is 35% below the maximum harvest that has been produced to date in the country. The 35% buffer protects against the possibility that the maximum historical harvest was not sustainable. The overall score is the weighted average of the individual scores for products that were harvested.
GOAL 4: CARBON STORAGE

This goal measures the extent and condition of natural coastal ecosystems, in this case sea grasses and tidal marshes that sequester and store large amounts of carbon. When preserved, carbon is stored in these ecosystems. When destroyed, carbon is emitted back into the atmosphere, becoming new sources of greenhouse gas emissions.

*The global reference point for carbon storage compares the current extent and condition of CO₂ storing coastal habitats (mangrove forests, sea grass meadows, and salt marshes) relative to their condition in the early 1980's.*
GOAL 5: COASTAL PROTECTION

This goal measures how well natural habitats (mangroves, seagrasses, coral reefs and sea ice [where present]) protect coastlines from flooding and erosion caused by storm waves. Global data were used for the first two and sea ice is not a factor in Fiji. However, evaluation of coral reefs used the same Fiji-specific data as was used in the Habitat subgoal for biodiversity. Again the net effect was very small: 76 in the Fiji study compared to 77 in the global study.

The global reference point for coastal protection compared the current extent and condition of five key habitats that protect coastlines (mangrove forests, seagrass meadows, salt marshes, tropical coral reefs and sea ice) from flooding and erosion relative to their condition in the early 1980s. The U.S. West Coast reference points are to maintain or restore salt marshes to 50% of their pre-industrial extent and condition; restore sand dunes to their extent and condition between the 1950s and 1960s; and support sea grasses by having zero nutrients introduced from land borne runoff.
GOAL 6: LIVELIHOODS AND ECONOMIES

This goal compares a region’s performance now to performance five years ago in two sub-categories: livelihoods and economies. A high score represents a minimal net loss of marine-sector jobs, wages, and economic revenues compared to all sectors.

Economies

This sub-goal examines the revenues from marine-related sectors and measures their relative growth, or decline, over the last five years.

Livelihoods

This sub-goal addresses how well the identity and livelihoods provided by marine-related sectors are sustained. It is measured by the number of marine-related jobs relative to a country’s growth, or decline, in employment rates over the last five years.
GOAL 7: TOURISM & RECREATION

Coastal and marine tourism are vital parts of a country’s economy. This goal measures the proportion of the total labor force engaged in the coastal tourism and travel sector, factoring in unemployment and sustainability.

The reference point for Tourism and Recreation measures the proportion of the total labor force engaged in this sector in each country, factoring in unemployment and sustainability. Regions were rank-ordered on the basis of that proportion and all regions above the 90th percentile - were given a score of 100.
GOAL 8: SENSE OF PLACE

The Sense of Place goal aims to capture aspects of the coastal and marine system that contribute to a person’s sense of cultural identity. This goal contains two sub-goals: culturally iconic species and the percentage of protected places.

The reference points are for all iconic species to be secure from risk of extinction and for 30% of nearshore waters and coastline to be protected in no-take reserves.

Lasting Special Places

Many coastal or nearshore locations have great meaning to people, but lists of those places are generally not available. As a proxy, the global study used lists of places in the band from 3 nautical miles seaward of the coast to 1 km inland that are protected for other reasons, including marine protected areas, conservation areas, historic sites or others.

Instead of using the 3 nm band, the Fiji study evaluated how well traditional fisheries management areas known as qoliqoli were protected. These fishing grounds are legally demarcated by the iTaukei (Indigenous) Lands and Fisheries Commission and Fiji has set a national goal of managing 30% of these areas. That 30% goal was used as the reference point for the Fiji study. Protection varies greatly within and among areas, including various mixes of unmanaged, conditionally closed, controlled or uncontrolled harvesting, or permanently closed to fishing. Using expert input, the ecological effectiveness of hte various management types were evaluated for a range of habitats and the total area of each management type was weighted using the ecological effectiveness score of the least protected habitat.

Whereas in the global study the Lasting Special Places subgoal score was calculated as the average of the scores in the 3 nm band offshore and the 1 km coastal band, in the Fiji study it was calculated as the area-weighted average of the scores for those two bands.

Iconic Species

This subgoal measures the condition of species that have particular cultural importance to help indicate how well a country's Sense of Place is being maintained. Few countries, including Fiji, maintain such lists. For the global study, the Index used lists prepared by the World Wildlife Fund (WWF).

For the Fiji study, regional experts selected 33 iconic species, providing a list that differed somewhat from that used in the global study. Experts were unable to estimate the status or population trends of five of those species: giant trevally (Caranx ignobilis), bluefin trevally (Caranx melampygus), trumpet conch (Charonia tritonis), golden cowrie (Cypraea tigris) and egg cowrie (Ovulva ovum). Regional data on status or extinction risk were used for loggerhead (Caretta caretta), leatherback (Dermochelys coriacea) and hawksbill (Eretmochylis imbricata) sea turtles. Local extinction risk assessments were not available for other species, so those risks were determined from global assessments. The analytical methods used in the two studies were identical.

The net result is that Iconic Species scored 60 compared to 51 in the global study.
GOAL 9: CLEAN WATERS

This goal measures contamination by trash, nutrients, pathogens and chemicals. Water pollution harms human health, livelihoods, and recreation, as well as the health of marine life and habitats.
GOAL 10: BIODIVERSITY

This goal measures how well a region’s biological diversity is being conserved for its existence value. Separate subgoals measure the conservation of Species and conservation of Habitats. The overall goal score is the average of the two subgoal scores.

Species

This sub-goal uses the same data and methods as in the global study, so there is no change in the score.

Habitats

This subgoal measure the health of mangroves, seagrasses, soft bottom habitats and coral reefs. Global data were used for the first three, but Fiji-specific data were available for the percentage of reefs covered by live coral so the study used that global data. The reference point for healthy coral cover was the percent cover expected for healthy coral reefs in the region, estimated as the average value for coral cover in neighboring countries, which was 29%. Fiji’s coral cover exceeded that value, so its coral health scored 100. The effect on the Habitat score was very small: 78 in the Fiji study compared to 79 in the global study.
TAKE HOME LESSONS

Even though Fiji's overall score did not change much, scores for some individual goals did. Some were much higher in the focal study (Artisanal Fishing Opportunities) and some much lower (Sense of Place, Natural Products). The decreased Sense of Place score is interesting because scores for its subgoals changed in opposite directions: Iconic Species went up but Lasting Special Places dropped substantially. Iconic Species scores increased when we used a Fiji-specific list of species. Lasting Special Places decreased after we adapted the model to use a Fiji-specific reference point and incorporated measures of ecological effectiveness of different levels of management.

Use of newer or finer resolution local data may raise scores where the new data reveal better status of species, habitats or economic factors that global data re able to reveal. However, such data can also lower scores if they reveal problems, such as habitat destruction, pollution or others that are too local (or too new) to be part of existing global databases.

The highest scoring goals in the Fiji study were: Food Provision (90); Artisanal Fishing Opportunities (92) and Tourism (97). The high score for the the likely future state of the first two goals suggests that scores will increase over the coming five years. The likely future score for Tourism is slightly lower than the current status score (93 compared to 97), so a small decline could occur.

The lowest scoring goals included: Natural Products (36), Lasting Special Places (48) and the Livelihoods subgoal of Coastal Livelihoods and Economies (52). For some production-oriented goals like Natural Products, low scores may simply reflect choices that have been made not to expand those sectors. If an initial stakeholder workshop had been held, stakeholders may have chosen not to assess some goals. Likely future scores for the first two goals are nearly the same as present status score, so the scores probably will not change much in the coming five years. The likely future score for Livelihoods is much lower than the present score (27 compared to 52), so a significant decrease in jobs and wages could occur in the near future.
HOW COULD THIS STUDY BE USED?

For the five goals for which Fiji had better data than were available from global databases, the resulting scores probably give a more accurate picture of local condition. Results of this study could be used for ongoing management objectives in Fiji because they indicate which goals and benefits appear to be doing well and which may not be. This does not necessarily mean that poor-scoring goals should be the ones to address first. For example, Mariculture scored 0 and Natural Products scored 36, but raising those number could be expensive, they may not be development priorities and their development may result in lower scores for other goals if, for example, mangroves or other habitats were damaged or displaced in order to develop farmed seafood or other products.

Another strategy could be to focus on improving components that influence more than one goal. For example, the extent and condition of mangroves, seagrasses and coral reefs play key roles in the scores for Coastal Protection, Biodiversity and (with the exception of coral reefs) Carbon Storage. There is opportunity to improve most of these scores, and conserving these marine habitats could be a strategic way to do that. Those habitats also have known links to Biodiversity, Fisheries Wild-Catch, Artisanal Fisheries Opportunities, Tourism, Livelihoods and Economies and Clean Waters, though the interactions would probably too indirect to show a causal relationship with changes in those scores.

Improving an Ocean Health Index score is only a surrogate for improvement in actual health in the ocean, along the coast and in human-ocean systems. The success of any actions taken will be seen in future scientific, social and economic measurements that would form the data for future iterations of the Ocean Health Index.

Fiji could consider modifying ongoing or future studies to provide data that could be useful if Fiji ever wanted to repeat this study. Repeating this study several times or -- better yet, on a scheduled basis -- could provide evidence for the efficacy of management actions.
“Never doubt that a small group of thoughtful committed citizens can change the world. Indeed, it is the only thing that ever has.”

- Margaret Mead

For more information visit:
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