DAVID Y. IGE
GOVERNOR OF HAWAII

VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. Box 3378
Honolulu, HI 96801-3378
doh.testimony@doh.hawaii.gov

Testimony in SUPPORT of HB2626 HD1
RELATING TO CESSPOOLS

REPRESENTATIVE SYLVIA LUKE, CHAIR
HOUSE COMMITTEE ON FINANCE

Hearing Date: February 23, 2018 Room Number: 308
Time: 2:00 pm

Fiscal Implications: The Department of Health (Department) would need an appropriation to hire a third-party consultant to conduct a study as noted in the measure. We appreciate and support the intent of this initiative, but defer to the Governor's Executive Supplemental Budget Request for the Department's appropriations and personnel priorities.

Department Testimony: The Department supports this measure. The Department agrees that in order to implement the requirements of Act 125, a thorough evaluation of pertinent considerations, including but not limited to funding mechanism options, sewer expansion and connection options, and best practice technology options for upgrading cesspools would be prudent at this time. Cesspools are a major source of pollution to Hawaii's waters. There are approximately 88,000 cesspools in the State, discharging approximately 53 million gallons of untreated sewage into the groundwater every day. Groundwater flows into drinking water sources; since ninety-five percent of all drinking water in Hawaii comes from ground water sources, this cesspool pollution can potentially harm human health. Groundwater also flows into streams and the ocean, harming public health and the environment, including beaches, recreational waters, and coral reefs. Hawaii needs to upgrade cesspools statewide as soon as feasible in order to protect the public health and environment.

The Department recognizes that it can take up to a year to procure the services of a third-party consultant. The deadline to submit the study should be extended by an additional year (December 31, 2020).

Offered Amendments:

SECTION 1. (c) should be amended to read:

"The department of health shall submit the study to the legislature by December 31, 2020."

SECTION 4. should be amended to read:

"SECTION 4. There is appropriated out of the general revenues of the State of Hawaii the sum of $ or so much thereof as many be necessary for fiscal years 2018-2019 and 2019-2020 to conduct a study on the upgrade, conversion, or connection of cesspools statewide, including financing issues, and financing mechanisms."

Thank you for the opportunity to testify on this measure.

County of Hawai'i
Council District 9 -
North and South Kohala

Chair: *Committee on Agriculture, Water & Energy*

Phone: (808) 961-8564
(808) 887-2069
Email: tim.richards@hawaiicounty.gov

Vice Chair: *Committee on Environmental Management*

HERBERT M. "TIM" RICHARDS, III
HAWAI'I COUNTY COUNCIL
District 9
25 Aupuni Street, Ste. 1402, Hilo, Hawai'i 96720

February 22, 2018

House Committee on Finance
Honorable Representative Sylvia Luke, Chair Email: repluke@capitol.hawaii.gov
Honorable Representative Ty J.K. Cullen, Vice Chair Email: repcullen@capitol.hawaii.gov

RE: **Support of HB2626 HD1**
Hearing Date/Time: February 23, 2018 at 2:00 p.m.

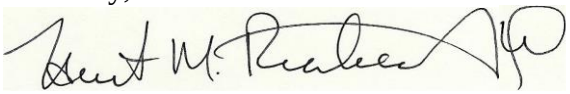
Dear House Representatives:

Thank you for the opportunity to submit **testimony in STRONG SUPPORT of HB2626 HD1**, which authorizes the Department of Health to hire a third-party consultant to conduct a study on the issues relating to the upgrade or conversion of cesspools, and establishes the cesspool conversion working group to assist in the study.

The passing of and the implementation of this bill is important to our island communities in providing a comprehensive report on preventing further contamination of our island's most precious resource – water. I therefore strongly urge the enactment of HB2626 HD1.

Please feel free to contact me should you need to discuss my position and knowledge of this matter further.

Sincerely,



TIM RICHARDS
Hawai'i County Council, District 9

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
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LORI M.K. KAHIKINA, P.E.
DIRECTOR

TIMOTHY A. HOUGHTON
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.
DEPUTY DIRECTOR

IN REPLY REFER TO:
WAS 18-37

February 21, 2018

The Honorable Sylvia Luke, Chair
and Members of the Committee on Finance
House of Representatives
State Capitol
415 South Beretania Street
Honolulu, Hawaii 96813

Dear Chair Luke and Members:

Subject: House Bill 2626 HD1, Relating to Cesspools

The City and County of Honolulu's (City) Department of Environmental Services generally supports HB 2626, and the long term conversion of cesspools to other waste disposal options.

HB 2626 and the proposed advisory council takes a more appropriate larger view which we believe is more appropriate. We believe it is important to take a community by community approach to determine what type of cesspool conversion is appropriate to prevent piecemeal conversions which would limit later willingness, and dollars, to switch to a community wide approach.

Additionally, while important, only addressing cesspool conversions may not fully address the groundwater and nearshore water pollution issues which generated the recent cesspool report. Consideration should be given to using resources to address the major sources of impact rather than just focusing on cesspools.

Thank you for your consideration.

Sincerely,

Lori M.K. Kahikina, P.E.
Director

CORAL REEF ALLIANCE

To: House Representative Chair Sylvia Luke Finance

Re: HB 2626 HD 1 Relating to Health
Friday, February 23, 2018 2:00 pm
Conference Room 308
State Capitol
415 South Beretania St.

From: Erica Perez- Program Manager (Hawai'i Island)
eperez@coral.org
Coral Reef Alliance (CORAL)

Subject: I am testifying in Support with comments of HB 2626 HD 1 relating to health to establish a study group within Dept. of Health to develop pilot program to address contamination relating to wastewater, cesspools, and shore waters at Puakō.

Links: *Puakō, Hawaii: Community Feasibility Study and Preliminary Engineering Report*

Attachments: 1) *Ecological Economic Modeling of Coral Reefs: Evaluating Tourist Overuse at Hanauma Bay and Algae Blooms at the Kı̄hei Coast, Hawai'i; 2) The Wall Street Journal* article, "*Hawai'i's Cesspools Threaten Drinking Water, Tourism"; 3) Replacing Cesspools with Improved Sewage Treatment in Puakō & Waialea Bay: A solution to safeguard Hawai'i's shoreline communities and coral reefs*

I am testifying in Support of HB 2626 HD 1 with additional comments, on behalf of the Coral Reef Alliance (CORAL). CORAL is an international coral reef conservation organization that works with communities, businesses, and governments to save coral reefs, with field offices on Maui and Hawai'i Island. CORAL uses a science-based approach to improve coastal water quality. CORAL's programs mitigate land-based sources of pollution, such as, wastewater discharge and stormwater runoff. Untreated sewage leaching from residential cesspools is one source of land-based pollution that negatively impacts Hawai'i's coral reefs. Sewage pollution contains disease-causing pathogens and nutrients, such as nitrates and phosphorus. Nutrients have been shown to cause damaging algae blooms which smother coral and promote coral disease. This pollution is a direct threat to coral and marine ecosystem health in Hawai'i and to the health of the public and tourists who swim in these waters.

News about Hawai'i's sewage pollution problem and the urgent need for infrastructure reform reached national and international audiences on February 11, 2018 when the Wall Street Journal published the article, *Hawai'i's Cesspools Threaten Drinking water*. Articles like this impact Hawai'i's tourism by invoking fear of human health impacts, as evidenced by numerous comments in response to this piece.

CORAL REEF ALLIANCE

Mitigating wastewater impacts on coral reefs can benefit the economy in many ways. In the attached Van Beaukering and Cesar 2004 study, researchers found that in Kehei, Maui, unsightly and damaging algae blooms caused from land-based pollution resulted in large losses to real estate value, hotel business profit, rental rates and stability of visitor profits. Encouragingly, researchers identified that mitigating the water pollution that causes algae blooms could result in significant benefits, such as, an increased real estate value of up to $30 million. The same study at Hanauma Bay, Oʻahu showed that ocean users are willing to pay an average of $10 more for their experience snorkeling or scuba diving a more healthy marine ecosystem compared to a degraded one.

CORAL's work with the Puakō community in South Kohala, Hawaiʻi, a priority location identified in the DOH 2018 Report Relating to Cesspools and Prioritization for Replacement can be used as a pilot study to assist the state in a statewide transition. CORAL facilitates the Clean Water for Reefs Puakō project to help the community to address their sewage problem in a way that safeguards the community and coral reef. Hawaiʻi's porous volcanic geology and high groundwater table, as found in Puakō, allows polluted wastewater to quickly flow into the groundwater, then to the sea or other waterways. These features render this location unsuitable for Individual Wastewater Systems (IWS) such as septic tanks and aerobic treatment units. The *Puakō, Hawaiʻi: Community Feasibility Study and Preliminary Engineering Report* (PER) conducted by AQUA Engineering evaluated three potential treatment options for Puakō. AQUA Engieering recommended an onsite treatment facility be installed to address human and coral health concerns (link to PER).

CORAL and our partners are helping the Puakō community to find ways to reduce the costs. One solution is to expand the user base of the facility through developing public-private partnerships. CORAL contracted Albert A. Webb Associates, who are experts in municipal finance, to analyze how expanding the user base of the facility through partnerships can impact homeowner rates. The attached, *Replacing Cesspools with Improved Sewage Treatment in Puakō & Waialea Bay: A solution to safeguard Hawai'i's shoreline communities and coral reefs* describes the economic benefits of such partnerships. Government support is essential to making these types of solutions feasible. Establishing a study group dedicated to identifying a soltion will help to make this project a reality for Puakō and inform solutions for other communities across the state.

We acknowledge the significant costs and capacity demand associated with leading this statewide effort. Due to the urgency of the problem we support a third party filling the capacity demand and support DOH in conducting the study with guidance from a state working-group and request that CORAL be invited to inform this process by having a seat on the proposed working group. CORAL's collaborative process and community engagement has led this grassroots community-based management initiative. The Clean Water for Reefs Puakō project identified a wastewater solution from a holistic approach, identifying sustainable financing, operations and management, and long-term engineering demands. Several treatment options were evaluated and none proved to be as cost-effective nor as environmentally beneficial as an onsite wastewater treatment facility.

CORAL REEF ALLIANCE

In closing CORAL supports HB 2626 HD 1 with amendments of adding Coral Reef Alliance as a member of the working group. This allows the State to use the momentum secured in the Puakō community to establish a pilot program to guide a large statewide transition. CORAL is enthusiastic to share lessons learned and be a part of identifying a sustainable and cost effective solution for wastewater treatment and discharge across the state which prioritizes both coral and human health.

Sincerely,

Erica Perez, Program Manager (Hawai'i Island)
eperez@coral.org
Coral Reef Alliance

U.S.

Hawaii's Cesspools Threaten Drinking Water, Tourism

Sewage from holes of human waste have state lawmakers scrambling to find a fix

In Puako, which is on the Big Island, residents fear cesspool sewage has affected the environment. PHOTO: PETER HACKSTEDDE

By Ian Lovett

Updated Feb. 11, 2018 3:39 p.m. ET

HONOLULU—Paradise has a sewage problem.

Cesspools—holes in the ground where untreated human waste is deposited—have become a crisis in Hawaii, threatening the state's drinking water, its coral reefs and the famous beaches that are the lifeblood of its tourist economy.

Sewage from cesspools is seeping into some of Hawaii's ocean waters, where it has been blamed for infections suffered by surfers and snorkelers. It is also entering the drinking water in part of the state, pushing nitrate levels close to the legal limit.

Hawaii has 88,000 cesspools across its eight major islands, more than any other state. Collectively, they deposit 53 million gallons of raw sewage into the ground every day, according to the state health department. More than 90% of the state's drinking water comes from groundwater wells.

State lawmakers, who outlawed new cesspools in 2016, are scrambling to find a solution to the thousands that exist.

Replacing all of the state's cesspools with alternate sewage systems would cost at least $1.75 billion, according to the health department.

The problem is concentrated in suburbs and rural areas outside Honolulu, where cesspools have long been the primary method for storing sewage from homes.

Most beaches remain safe for swimming, and public water remains safe to drink for now, state officials said. The tourism industry continues to grow each year, despite

instances of contamination at beaches.

But the problem is growing worse, officials said, as the state's population has continued to grow.

In Upcountry Maui, a rural area in the central part of the island where drinking-water wells are most threatened by cesspools, officials are monitoring water quality closely.

At one groundwater well, nitrate levels are already at 8.7 milligrams a liter; the legal limit is 10, and the Department of Health estimated that some parts of the aquifer are already over that limit. Environmentalists say they are worried about the potential effect of the water on infants, who can be killed by high levels on nitrates, which are chemicals found in fertilizer and sewage.

State Sen. J. Kalani English, who represents Upcountry Maui, said it can cost as much as $100,000 to replace each cesspool, a prohibitive figure for most property owners. There are about 8,000 cesspools in Upcountry Maui alone.

Replacing the cesspools is "a huge financial burden," he said.

Hawaii's cesspool problem is a remnant of its agricultural past, when many parts of the state were off the electrical grid. Mr. English said, growing up on Maui, he remembered digging holes for outhouses, and then after a few years filling them with lye and digging new ones.

Outside of Honolulu, the state remains largely rural, and the mountainous terrain makes laying sewer lines to connect to sewage treatment plants expensive and, in many areas, not feasible.

Many bathrooms in homes outside Honolulu still pump sewage into nearby holes in the ground.

Before they were outlawed, the state received about 500 requests to put in new cesspools each year. Last year, the state passed a law requiring all cesspools to be replaced by 2050.

Yet, some residents resist plans to replace cesspools, worried about expense. In January, Upcountry Maui residents overwhelmed a Department of Public Health meeting, complaining about potential costs.

"You may want a clean environment, but you can't afford to pay for it," said Keith Kawaoka, deputy director for environmental health at the state agency. "It's a real dilemma."

Lawmakers are still searching for solutions. They recently called on engineers to bring them new ideas, adding that simply converting to septic systems—in which solids and liquids of waste are separated and the solids are later pumped out—wouldn't solve the contamination problems in some areas, because nitrates would still seep into the groundwater.

Health officials said the 740 cesspools around Kahaluu, on the east coast of Oahu, contributed to high bacteria counts in the bay.

"Skin infections consistent with sewage-contaminated surface waters have been documented in this area," the department's report said.

Officials said it is difficult to definitively prove that any specific infection resulted from sewage contamination.

In Puako, a popular snorkeling destination on the Big Island, residents fear that sewage from the area's 150 cesspools has already harmed the coral reef, which is its signature tourist attraction.

Peter Hackstedde, president of Puako Community Association, said he now avoids the water if he has a cut; he has gotten infected before.

He said the community had already spent more than $2.5 million of its own money studying the problem.

"We found that sewage is leaking into the ocean, and we swim in it," Mr. Hackstedde said.

They now hope to install a small-scale sewage-treatment plant, which would avoid having to dig and install pipes to the nearest town, about 50 miles away.

A treatment plant would cost about $15 million, Mr. Hackstedde said, and residents don't want to put up that money on their own. He said his association is hoping for a public-private partnership.

"Everyone who lives down here is pretty much for cleaning up the ocean," Mr. Hackstedde said. "We just need the money."

Write to Ian Lovett at Ian.Lovett@wsj.com

Appeared in the February 12, 2018, print edition as 'Hawaii's Big Headache: Cesspools.'

Replacing Cesspools with Improved Sewage Treatment in Puakō & Waialea Bay

A solution to safeguard Hawai‘i’s shoreline communities and coral reefs

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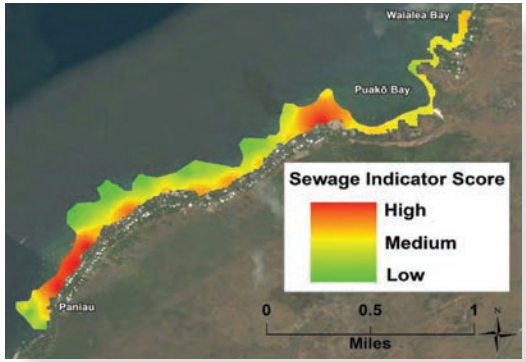
Problem

Coastal waters across the State of Hawai'i are polluted with 90,000 cesspools releasing 55,000 gallons of raw sewage into our groundwater every day, allowing high levels of nutrients and pathogens to enter the marine environment. This sewage poses risks to human health, damages coral reefs and threatens the tourism industry.

The communities of Puakō and Waialea Bay, in South Kohala, Hawai'i Island showcase this problem and provide us with an ideal case study site to pilot a replicable and scalable solution. Experts from The Nature Conservancy (TNC) and University of Hawai'i Hilo (UHH) have studied these coastal waters intensively and have demonstrated that leaky residential cesspools and septic tanks release high quantities of raw sewage along the shoreline. Seventy-six percent of all sites sampled between 2013 and 2016 exceeded the Hawai'i Department of Health (DOH) standard for fecal indicator bacteria with 91 percent having medium to high pollution scores.



91% had medium to high pollution scores

76% exceeded Hawai'i DOH standard for bacteria found in sewage

66% had high nutrient levels

A strategic solution is needed to safeguard Hawai'i's communities and coral reefs and enable Hawai'i to achieve its goal to replace all cesspools across the state with superior technology by 2050.

Strategic Solutions

Clean Water for Reefs Puakō

To resolve the sewage problem in Puakō and Waialea Bay, the Coral Reef Alliance (CORAL) established Clean Water for Reefs Puakō—a collaborative, community driven project whose goal is to identify and implement an alternative to outdated cesspools and septic tanks. CORAL has worked in these communities since 2014 to identify a solution that maximizes environmental and human health benefits while remaining cost effective for homeowners. The proposed solution has four components.

Component 1: Onsite Wastewater Treatment Facility

In 2014, CORAL contracted AQUA Engineering (AQUA) to conduct the Puakō, Hawai'i Community Feasibility Study & Preliminary Engineering Report[1]. AQUA identified and analyzed three alternatives to cesspools and concluded that the solution that best met the project goals would be an onsite wastewater treatment facility with a low-pressure collection system. The proposed facility is more affordable than the gravity-fed systems that are commonly used in Hawai'i because it employs a collection system that is easier to install and maintain.

[1] Please refer to Supplemental Documents

Component 2: Chapter 32 Financing Mechanism

Financing the facility through the *Hawai'i County Code Chapter 32: Special Improvement Financing by Community Facilities Districts (CFD)*[2] process represents a novel solution to ensure long term financial sustainability of the system by creating a predictable revenue stream in the form of a special tax with two components:

1. **Operation and Maintenance (O&M):** Every homeowner will pay the same fee of $1,200 per year to cover operation and maintenance costs. Owners of undeveloped lots will not pay this fee.
2. **Facility Rate:** Every homeowner will pay a fee which is calculated based on the square footage of each home. This will cover the debt service on a loan or municipal bond issuance, funds for capital replacement costs, reserve fund and administrative costs.

To initiate a CFD process, 25 percent of landowners (by acreage) must sign a petition to support the improvement. During the public comment period the CFD process can be stopped if more than 55 percent of land owners (by acreage or Tax Member Key [TMK] number) submit written protest. If all steps are completed and supported, the CFD is established and the special tax is levied and payable annually by lot owners.

Component 3: Public-private Partnership

Implementing improvements to wastewater infrastructure in Hawai'i is challenged by lack of funding and capacity, as well as local demands which limit the county's ability to take on new projects. Building and operating the onsite wastewater treatment facility through a public-private partnership maximizes environmental and human health benefits and increases the financial feasibility of the facility for homeowners by expanding the user base, increasing the total amount of sewage treated, and decreasing cost per gallon treated.

Component 4: Securing Additional Funds

Community survey results from 30 respondents indicate that a mean annual rate of $1,500 (including O&M and facility rate) would place costs of the facility within financial reach. CORAL contracted Webb Associates, experts in civil engineering and planning services, to explore scenarios in which additional funds ($3, $5, $7 and $9 million) for capital development costs are raised, in order to reduce the cost for homeowners to the acceptable annual rate of $1,500.

The analysis indicates that implementing an onsite wastewater treatment facility in partnership with the Puakō Marine Lab and Hapuna State Parks and raising a further $7 million can make the proposed facility financially feasible to homeowners.

[2] Please refer to Supplemental Documents

Financial Feasibility Analyses

The recommended onsite treatment facility could be designed to serve the Puakō and Waialea communities alone, or designed to also serve other local entities such as the proposed Puakō Marine Lab and the Hapuna State Park system. Three potential user options were investigated to spread the cost more equitably across a larger user base. In Option A, the full facility rate is spread across the Puakō and Waialea communities. As elaborated below, this option is financially unfeasible for homeowners. In Options B and C, which involve public-private partnerships, costs are more broadly distributed and the percentage of the facility rate paid for by each user group is proportional to the gallons of sewage they are estimated to produce. Exempt lots are not included within the CFD financing mechanism and would require capital costs based on usage to be settled by other means. The analyses illustrates the special tax payable by homeowners for the three options and how this tax can be reduced if an additional $3, $5, $7 or $9 million can be raised to support capital development costs.

The analyses are based on the following assumptions and considerations:

- The facility will require a 40-year loan at a 3.5 percent interest rate
- Capital and development costs include 30 percent contingency
- The operation and maintenance rate will increase 3 percent annually due to inflation

Note that under Act 120 “a temporary income tax credit for the cost of upgrading or converting a qualified cesspool to a septic tank system or an aerobic treatment unit system, or connecting to a sewer system are eligible for the $10,000 tax credit.” Currently, 53 TMK lots are eligible for this tax credit, which would result in further reducing the special tax burden for qualifying homeowners by approximately $500 per year. This additional cost reduction is not included in the analyses below.

Estimates on number of gallons of wastewater treated for each user group are from the following sources[3]:

- *Puakō, Hawai‘i Community Feasibility Study & Preliminary Engineering Report (PER)*
- *Final Environmental Assessment Puakō Marine Education and Research Center Puakō, Island of Hawai‘i, Hawai‘i*
- *Final Environmental Impact Statement Hapuna Beach State Recreation Area Expansion Lalalimo, South Kohala, Hawai‘i*

[3] Please refer to Supplemental Documents

Option A

Users: Puakō and Waialea Bay communities
Full capital cost of facility: $14.5 million
Usage: 60,300 gallons per day
Properties connected: 268 TMKs / 89 acres

Option A would require Puakō and Waialea Bay homeowners to take on the full cost of constructing the facility. Table 1 represents community support for the onsite treatment facility under this financing scenario. Although results from community surveys and engagement show significant community support for implementing an onsite treatment facility (43 percent by TMK and 41 percent by acreage), the financial burden is cost prohibitive for many homeowners—even with the scenario in which an additional $9 million is raised (see Table 3). Only 23 percent of TMK landowners support the facility at full cost. Table 2 is important to demonstrate the wide income disparity in Puakō and Waialea Bay communities. Although the mean household income of $140,770 exceeds what most wastewater infrastructure grants will approve, the table shows that there are many homeowners who would not be able to afford the costs.

Table 1: Community support for the onsite treatment facility

Puakō & Waialea Bay Engagement & Support	# of TMKs	% TMKs	Acreage	% Acreage
Total TMK Lots	268	100%	89	100%
In Community with	232	87%	76	86%
Not in Community with	36	13%	12	14%
Total Support	110	41%	38	43%
Total Do Not Support	75	28%	22	25%
Cost Concern Data	**# of TMKs**	**% TMKs**	**Acreage**	**% Acreage**
Total TMK Concern Over Annual Cost	94	35%	27	31%
TMKs that have No Concern Over Annual Cost	61	23%	18	20%

Statistics are current as of 8/31/17 and change on a daily basis.

Table 2: Community demographics for Puakō and Waialea Bay

Income and Benefits (2015 Inflation-Adjusted Dollars)	Estimate	Margin of Error	Percent	Margin of Error (%)
Total Households	**343**	**+/-62**	**100.00%**	**(X)**
Less than $10,000	19	+/-11	5.50%	+/-3.2
$10,000 to $14,999	8	+/-8	2.30%	+/-2.4
$15,000 to $24,999	24	+/-23	7.00%	+/-6.3
$25,000 to $34,999	6	+/-9	1.70%	+/-2.6
$35,000 to $49,999	28	+/-15	8.20%	+/-4.6
$50,000 to $74,999	89	+/-39	25.90%	+/-9.1
$75,000 to $99,999	26	+/-15	7.60%	+/-3.9
$100,000 to $149,000	40	+/-23	11.70%	+/-6.2
$150,000 to $199,999	28	+/-17	8.20%	+/-4.7
$200,000 or more	75	+/-24	21.90%	+/-6.9
Median Household Income (Dollars)	73,750	+/-23,643	(X)	(X)
Mean Household Income (Dollars)	140,770	+/-27,741	(X)	(X)

Source: U.S. Census Bureau, 2011-2015 American community Survey 5-year Estimates

Table 3: Cost and rate analysis for Option A

User Group	Usage (GPD)	Percent Total Usage by User Group	Proportionate Capital Cost Based on Usage (Full Cost)	$3M Reduction	$5M Reduction	$7M Reduction	$9M Reduction		
Puakō & Waialea	60,300	100%	$14,452,399	$11,452,399	$9,452,399	$7,452,399	$5,452,399		
Facilities Tax Class	**TMK Square Footage Ranges**		**Facilities Rate**					**O&M Rate**	**# of Units**
D1	Less than 1,000		$1,600	$1,285	$985	$685	$440	$1,200	82
D2	1,001 to 2,250		$2,600	$2,085	$1,735	$1,385	$1,040	$1,200	78
D3	2,251 to 3,500		$3,600	$2,885	$2,485	$2,085	$1,640	$1,200	47
D4	3,501 to 4,750		$4,600	$3,685	$3,235	$2,785	$2,240	$1,200	18
D5	4,751 to 6,000		$5,600	$4,485	$3,985	$3,485	$2,840	$1,200	4
D6	6,000 and greater		$6,600	$5,285	$4,735	$4,185	$3,440	$1,200	2
UND	Undeveloped Property		$4,600	$6,379	$5324	$4,269	$3,214	$0	37
Average Total % Cost Savings to TMK Lot Owners			**0%**	**15%**	**23%**	**32%**	**41%**		**268**

Option B

Users: Puakō and Waialea Bay communities and Puakō Marine Lab
Full capital cost of facility: $14.5 million
Usage: 67,710 gallons per day
Properties connected: 269 TMKs / 94 acres

Option B would spread the cost between the Puakō and Waialea Bay homeowners and the Puakō Marine Lab. The current facility design as outlined in the PER is sufficient to meet the needs of the communities and the lab. The University of Hawai'i (UH) Foundation plans to build the Puakō Marine Lab on state land in between Puakō and the Waialea community, for which it already has a lease. The wastewater treatment facility can be sited on this land, thus reducing the cost of the project by $500,000, which is not demonstrated in the above analysis. With this option, the financial burden continues to be cost prohibitive for homeowners. Even if an additional $9 million is raised the annual cost to homeowners is greater than the annual target of $1,500 (see Table 4).

Table 4: Cost / rate analysis for Option B

User Group	Usage (GPD)	Percent Total Usage by User Group	Proportionate Capital Cost Based on Usage (Full Cost)	$3M Reduction	$5M Reduction	$7M Reduction	$9M Reduction		
Puakō & Waialea	60,300	89%	$12,870,767	$9,870,767	$7,870,767	$5,870,767	$3,870,767		
Puakō Marine Lab	7,410	11%	$1,581,632	$—	$—	$—	$—		
Total	**67,710**	**100%**	**$14,452,399**	**$9,870,767**	**$7,870,767**	**$7,452,399**	**$3,870,767**		
Facilities Tax Class	TMK Square Footage Ranges		Facilities Rate					O&M Rate	# of Units
D1	Less than 1,000		$1,440	$1,010	$760	$510	$320	$1,200	82
D2	1,001 to 2,250		$2,340	$1,810	$1,460	$1,110	$770	$1,200	78
D3	2,251 to 3,500		$3,240	$2,610	$2,160	$1,710	$1,220	$1,200	47
D4	3,501 to 4,750		$4,140	$3,410	$2,860	$2,310	$1,670	$1,200	18
D5	4,751 to 6,000		$5,040	$4,210	$3,560	$2,910	$2,120	$1,200	4
D6	6,000 and greater		$5,840	$5,010	$4,260	$3,510	$2,570	$1,200	2
UND	Undeveloped Property		$7,127	$5,545	$4,490	$3,435	$2,380	$0	37
Average Total % Cost Savings to TMK Lot Owners			**7%**	**21%**	**30%**	**39%**	**49%**		**268**

Option C

Users: Puakō and Waialea Bay communities, Puakō Marine Lab and Hapuna State Parks
Full capital cost of facility: $18.1 million
Usage: 136,870 gallons per day
Properties connected: 269 including all Hapuna Beach System TMKs / 940 acres*
**Assumes all 846 acres of Hapuna property will be serviced by the facility*

Option C would spread the cost between Puakō and Waialea Bay homeowners, the Puakō Marine Lab and Hapuna State Parks. The facility design would need to be altered to absorb the extra capacity and the project cost will increase to $18.9 million. Despite the capital cost increase, the annual cost to homeowners is lowered because project costs are distributed across more users and the facility becomes financially feasible for 82 TMKs with only an additional $7 million raised (see Table 5).

Table 5: Cost / rate analysis for Option C*

User Group	Usage (GPD)	Percent Total Usage by User Group	Proportionate Capital Cost Based on Usage (Full Cost)	$3M Reduction	$5M Reduction	$7M Reduction	$9M Reduction		
Puakō & Waialea	60,300	44%	$8,303,572	$5,303,572	$3,303,572	$1,303,572	$—		
Puakō Marine Lab	7,410	5%	$1,020389	$—	$—	$—	$—		
Hupuna Park	69,160	51%	$9,523,632	$—	$—	$—	$—		
Total	**136,870**	**100%**	**$18,847,593**	**$5,303,572**	**$3,303,572**	**$1,303,572**	**$—**		
Facilities Tax Class	**TMK Square Footage Ranges**		**Facilities Rate**					**O&M Rate**	**# of Units**
D1	Less than 1,000		$730	$435	$225	$105	$—	$1,200	82
D2	1,001 to 2,250		$1,530	$1,010	$675	$330	$—	$1,200	78
D3	2,251 to 3,500		$2,330	$1,585	$1,125	$555	$—	$1,200	47
D4	3,501 to 4,750		$3,130	$2,160	$1,575	$780	$—	$1,200	18
D5	4,751 to 6,000		$3,930	$2,735	$2,025	$1,005	$—	$1,200	4
D6	6,000 and greater		$4,730	$3,310	$2,475	$1,230	$—	$1,200	2
UND	Undeveloped Property		$4,718	$3,136	$2,081	$1,025	$—	$0	37
Average Total % Cost Savings to TMK Lot Owners			**27%**	**42%**	**51%**	**63%**	**74%**		**268**

**Cost allocation is based on usage on weekends at buildout.*

Conclusion

Option C – building and operating this facility through a public-private partnership with the Puakō and Waialea Bay Community, Puakō Marine Lab and Hapuna State Parks – creates the greatest environmental and human health benefits, while achieving financial feasibility for homeowners. Raising an additional $7 million will enable us to reach our target of reducing the annual cost to $1,500 per year for 82 homeowners in Puakō and Waialea Bay.

Direct benefits resulting from implementing this plan include:

- Approximately 50 million gallons of wastewater will be prevented from entering the marine environment each year, which will improve coral reef health and reduce risks to human health.
- Cost efficiency associated with building and operating the onsite wastewater treatment facility will be maximized by expanding the user base, increasing the total amount of sewage treated and decreasing the cost per gallon treated.
- Homeowners will benefit from a 63 percent reduction in annual rates, resulting in a rate that is financially feasible for class D1 homeowners.

Beyond the direct benefits that can be generated along the Puakō shoreline, establishing a successful model in Puakō could lay the groundwork for adoption of this model across Hawai‘i. This would not only support Hawai‘i’s 2050 goal to replace all cesspools across the state with superior technology, but could provide a long-term solution to safeguard the health of both people and coral reefs for future generations.

Next Steps

- Secure a public-private partnership for owning, operating and maintaining the wastewater treatment facility
- Establish a partnership with the University of Hawai‘i (UH) Foundation to support capital development, potentially provide land on which the facility could be built, and connect the proposed UH Foundation-owned Puakō Marine Lab to the wastewater treatment facility
- Establish a partnership with Hapuna State Parks to support capital development, and connect state park restrooms to the wastewater treatment facility
- Raise an additional $7 million to ensure that the annual cost to homeowners in the Puakō and Waialea Bay communities is financially feasible
- Continue to engage the Puakō and Waialea Bay communities and keep them apprised of updates and setbacks

Clean Water for Reefs Project Information

The Clean Water for Reefs Puakō project is guided by an advisory committee, which comprises experts and representatives from, academia, the Puakō and Waialea communities, as well as representatives from the construction, civil engineering and nonprofit sectors. In addition to this committee, a suite of experts have consulted on the engineering, planning and financing aspects of this project.

Advisory Committee

University of Hawai'i Hilo

Puako Community Association

Hawai'i Rural Water Association

The Nature Conservancy — Protecting nature. Preserving life.™

South Kohala Coastal Partnership

Coral Reef Alliance

Consulting Experts

Green Air

Albert A. Webb Associates

GA Geometrician Associates

AQUA Engineering

Ecological Economic Modeling of Coral Reefs: Evaluating Tourist Overuse at Hanauma Bay and Algae Blooms at the Kīhei Coast, Hawai'i[1]

Pieter J. H. van Beukering[2] *and Herman S. J. Cesar*[2,3]

Abstract: In this paper we present the first ecological economic model of coral reefs in Hawai'i. This model contains the main elements required to assess the full picture of coral reef management and thereby enables scientists and managers to evaluate ecological and economic impacts effectively. The model is applied to two case studies, tourist overuse in Hanauma Bay, O'ahu, and algae blooms along the Kīhei coast, Maui. The Hanauma study showed that visitors are willing to pay much more for their experience (around $10) than they are currently doing and that the net benefits of the education program (around $100 million) greatly exceed the cost of the program (around $23 million) over time. The Kīhei coast study concluded that the algae problem causes large losses of real estate value and hotel business and that mitigation could result in benefits of $30 million over time. This would justify major investments in lowering nutrient discharges in the coastal zone.

All over the world, anthropogenic disturbances have been linked to the vast majority of decreases in coral cover (Birkeland 1995). In Hawai'i, one of the largest threats to coral reefs is human expansion and economic development (Clark and Gulko 1999, Gulko et al. 2001). Whether it is direct sedimentation onto the reef, or an increase in the turbidity of the water due to eutrophication, or increases in the amounts of nutrients that enhance the growth of other reef organisms, all these impact on coral health.

The interaction between ecological and economic processes is complex. Yet, it is often this interaction between the two dimensions that is crucial to our understanding of why coral reefs are degrading and how such degradation can be prevented. Therefore, there is an urgent need for a more systematic approach to the integration of ecological and economic processes.

To effectively evaluate the complex interface between reef-related ecological and economic processes, simulation modeling can play a useful role. Modeling techniques allow for systematically structuring the multifaceted web of ecological and economic relationships while providing quantification of the examined scenarios. The objective of the study is threefold: (1) to develop an ecological economic model of the coral reefs of Hawai'i; (2) to apply the model to specific selected case study areas; and (3) to determine the economic costs of reef degradation and to compare costs and benefits of various management options that aim to reverse the trends in these case study areas.

To demonstrate the developed model, two case studies were selected within the region of the main Hawaiian Islands (Figure 1): Ha-

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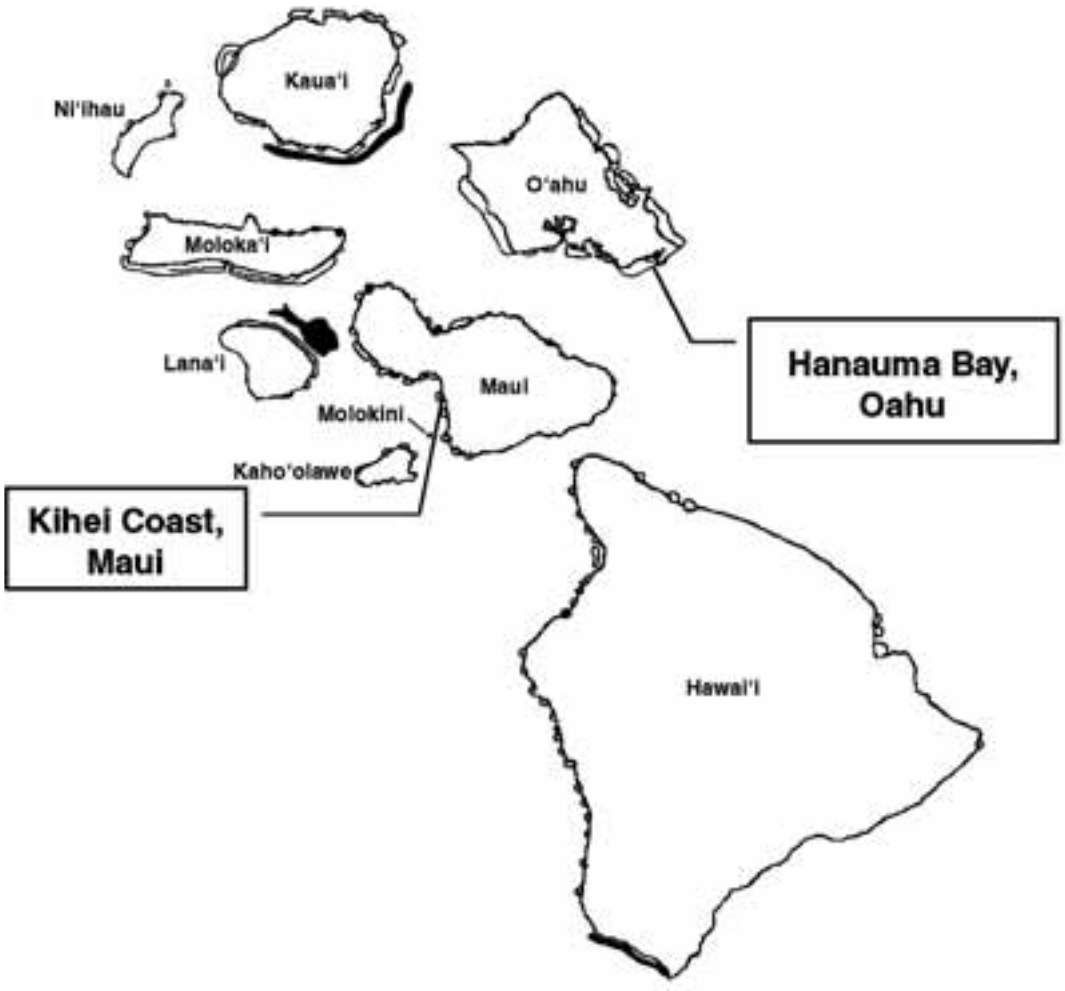

FIGURE 1. The main Hawaiian Islands and the selected case studies.

nauma Bay (O'ahu), addressing tourist overuse, and Kīhei (Maui), addressing excessive nutrients and algae blooms.

MATERIALS AND METHODS

The Model

A simplified dynamic simulation model has been developed to deal with the environmental and economic complexities that surround coral reefs in Hawai'i. This integrated model, referred to as SCREEM (Simple Coral Reef Ecological Economic Model), links ecology and economy in a dynamic manner. SCREEM incorporates the relevant ecological economic relations by following pathways linking the type of coral reef ecosystem and its uses and location with the physical goods and services provided by this reef type and the economic value of these values. The model was developed with the software package VENSIM (2000). A conceptual version of an ecological economic model for coral reef decision making was presented by Gustavson et al. (2000).

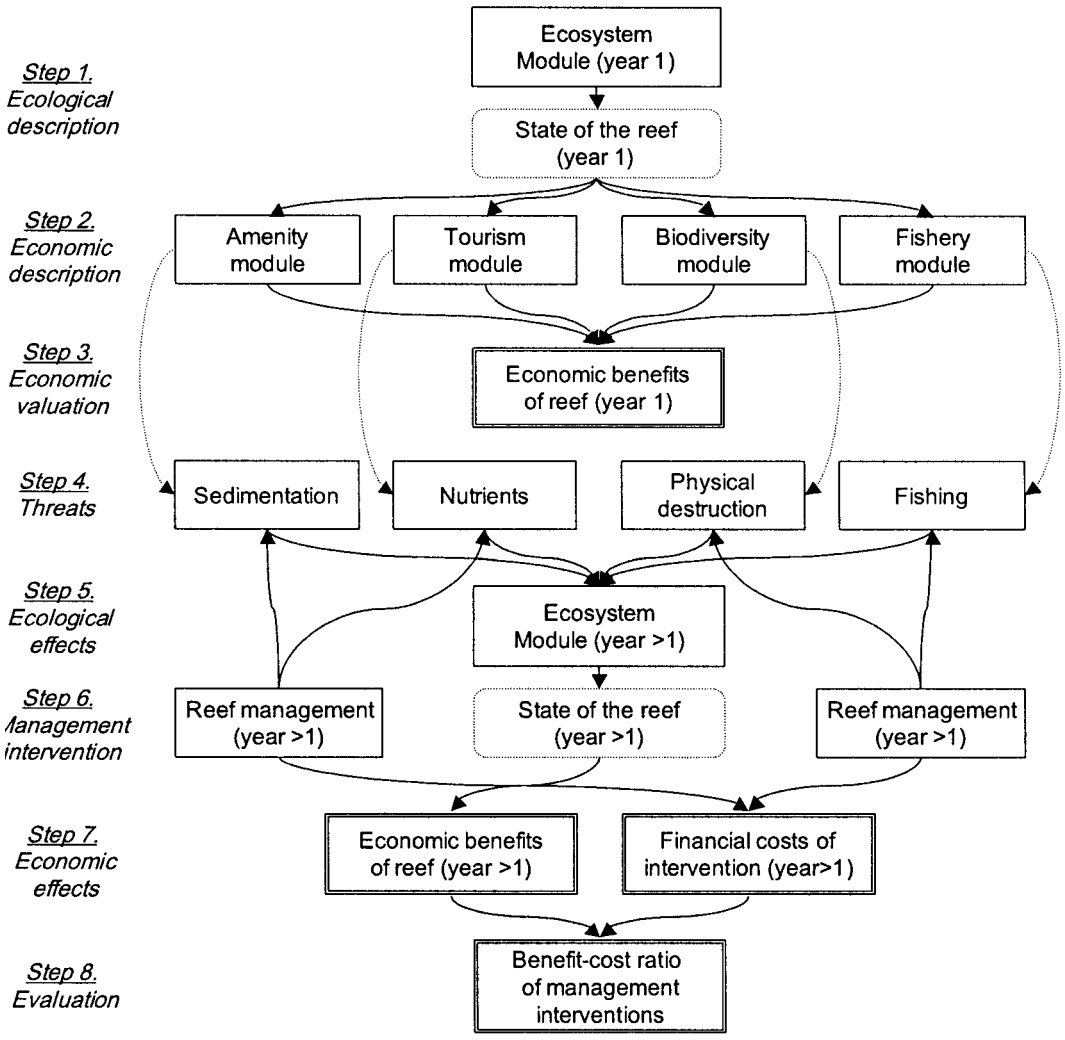

FIGURE 2. General framework of the dynamic simulation model.

Figure 2 highlights the key features of this model and the interactions between different ecological and economic components. It also shows the threats and their impact on ecological factors, as well as the necessary interventions required to mitigate these threats. Finally, the associated costs and benefits of the interventions are displayed. The model uses a 50-yr period (2000–2050); this allows enough time for the main ecological outcomes to come into effect while being short enough to allow for predictions about future developments. For a general discussion on time horizons in environmental economics, see Pearce and Turner (1990).

Step 1 combines the five main ecological indicators (coral cover, coral biodiversity, fish stock, fish biodiversity, and macroalgae cover) into one composite "state of the reef" indicator. Step 2 of the model describes the various reef ecosystem functions, which are translated into reef-associated goods and ser-

vices to Hawai'i society. The goods and services here are fisheries, tourism, amenities, and biodiversity, although the model can be adjusted easily to incorporate additional functions and goods and services (Moberg and Folke 1999).

Each of these goods and services has associated economic benefits. The value of the sum of compatible uses of these goods and services forms the total economic value of coral reef ecosystems (e.g., Spurgeon 1992, Barton 1994, Costanza et al. 1997). The procedure of calculating the total economic value of different coral reefs in Hawai'i is explained in detail in Cesar and Van Beukering (2004, this volume). In this article we limit ourselves to explaining the main features of SCREEM and to presenting the case study results. In the following, the model is presented in separate modules that are interrelated. These modules include ecology, tourism, amenities, and biodiversity. Because the two case studies lack substantial benefits and dynamics of fisheries, the fishery module is not specifically addressed in this article (see Friedlander and Parrish [1998] and the literature quoted there).

ECOLOGICAL MODULE. The complexity of the ecology of coral reefs makes it difficult to model these processes in a realistic manner. To simulate the numerous interdependencies and the multiple threats to coral reefs requires a huge modeling effort with enormous data needs. Even then, it leaves us with large scientific uncertainties. On the other hand, ignoring the ecological processes in the analysis is also undesirable. Therefore, we have developed an ecological module in SCREEM on the basis of existing knowledge and literature. The basic structure of this model is shown in Figure 3.

SCREEM is designed to simulate various different types of threats to the Hawaiian coral reefs. In the two case studies described here we particularly focus on two threats (Grigg and Dollar 1990). In the Hanauma Bay case study, we look specifically at the threat of tourism overuse. (Uncontrolled tourist development can lead to physical destruction of coral through trampling, contact with divers, and anchor damage.) The case study in Kīhei focuses on the combination of excess nutrients, runoff, and coastal hardening, thought to be some of the main causes of the algae blooms in North Kīhei. (Insufficient sewage treatment can lead to excess nutrients that stimulate algae growth, which can overgrow the corals. This problem is particularly acute close to estuaries of rivers and urban centers [Rogers 1990].) To understand the impact of the individual threats a literature review was conducted (see Cesar et al. [2002] for more details). From this review relationships were estimated between the threats and the different ecological indicators of the coral reef.

SCREEM addresses five ecological indicators that represent the most important environmental characteristics of a coral reef. These are coral cover, coral biodiversity, fish stock, fish biodiversity, and macroalgae cover. These variables are exogenously determined for the first year of the analysis and develop endogenously over time. To present these ecological indicators in a workable manner, and to connect them to the economic modules, a composite indicator is constructed: "the state of the reef" indicator.

The following sequential stages take place in the ecological module. First, the individual ecological indicator scores are normalized into a score between 0 and 1. For example, in a site where the maximum coral cover is 60% and the minimum is 0%, these levels are defined as 1 and 0, respectively. A coral cover of 30% is then interpolated linearly with a score of 0.5. The relationship between the normalized score and the indicator is called the value function. Although this function can have different shapes, in our model this function is assumed to be linear. Second, the normalized individual scores are aggregated by attaching weights to the indicators that represent the relative ecological importance of the indicator as compared with the other indicators. In Hawai'i the following weights have been applied: coral cover (30%), coral biodiversity (20%), fish stock (20%), fish biodiversity (15%), and macroalgae cover (15%). These weights are based on expert judgments. Finally, the behavior over time of the "state of the reef" indicator, which by definition

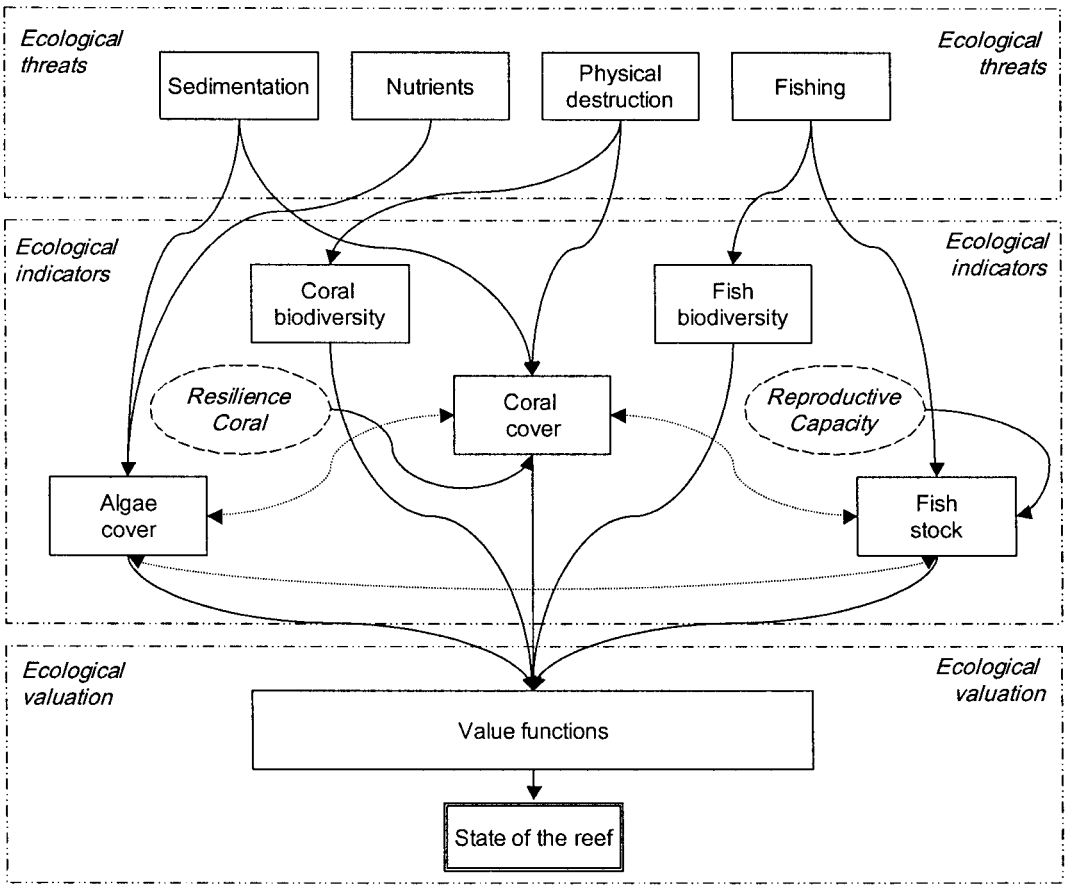

FIGURE 3. Ecological module.

moves between a score of 0 and 1, is determined. The three stages fall within the ecological module. The modules discussed next address processes that fall within the boundaries of the economy.

TOURISM MODULE. Some 200,000 divers and more than 3 million snorkelers enjoy the Hawaiian reefs every year. They pay a substantial amount in direct and indirect expenditure to admire the unique marine life. Thereby they support a large aquatic tourist industry. In 2002, more than 100 dive and snorkeling operators were registered in Hawai'i, earning between $50 and 60 million per annum. But the recreational expenditures related to coral reefs extend much further than direct dive- and snorkel-related revenues. Bus and taxi drivers bring tourists to popular destinations such as Hanauma Bay, and hotels lodge these same tourists and restaurants feed them after a long day in the water. Therefore, calculating the recreational benefits involves much more than simply adding up the value added of the dive and snorkel industry. In fact, it involves calculating producer surplus for both direct and indirect expenditure as well as consumer surplus. This is described in detail in this issue in Cesar and Van Beukering (2004).

To determine the dynamics of the recreational benefits, prices and quantities for 2001 were fed into the model. Figure 4 shows the overall structure of the tourism module. An important assumption in the model is the re-

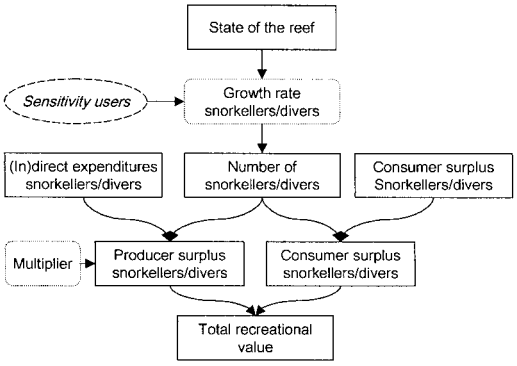

FIGURE 4. Tourism module.

lationship between the growth rate and the "state of the reef." Both the dive industry survey and the diver and snorkel survey indicated the dependency of marine activities on the quality of coral reef ecosystems. If the quality of the reef worsens further over time, fewer tourists will decide to go snorkeling or diving. In fact, the growth rate may even become negative at a certain given quality level of the coral reefs. The last step in the tourism module is the summation of the consumer and producer surplus for both the diving and snorkeling activities into the total recreational value.

AMENITY MODULE. Houses, hotels, and condominiums in the vicinity of a healthy marine system are generally more valuable than comparable properties elsewhere. This surplus value of houses and hotel rooms in the vicinity of healthy marine systems has been measured through a survey that we carried out. Combining this with the number of the residential houses, condominiums, and hotel rooms leads to a positive amenity value attributable to a healthy coral reef. On the basis of the expert judgment of real estate agents we assumed that 1.5% of the sale price of the properties is attributable to the coral reefs. This is shown by the outer part of Figure 5.

In the case of a negatively impacted coral reef ecosystem, such as seen at North Kīhei in Maui, this positive value will be much lower. The macroalgae problem on the Kīhei coast is believed to cause a negative impact on property values of the affected condominiums as well as the rental prices and vacancy rates in transient accommodations. Therefore, in addition to the positive value attributed to the beneficial aspects of a coral reef, negative impacts are occurring as a result of the coral-linked algae problem. This additional negative impact on the amenity value is indicated in Figure 5 by the shaded segment.

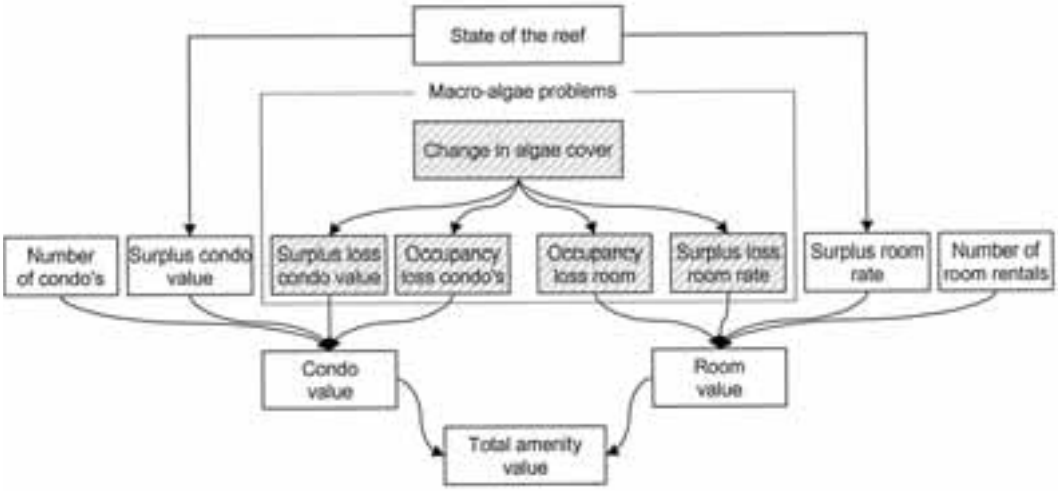

FIGURE 5. Amenity module.

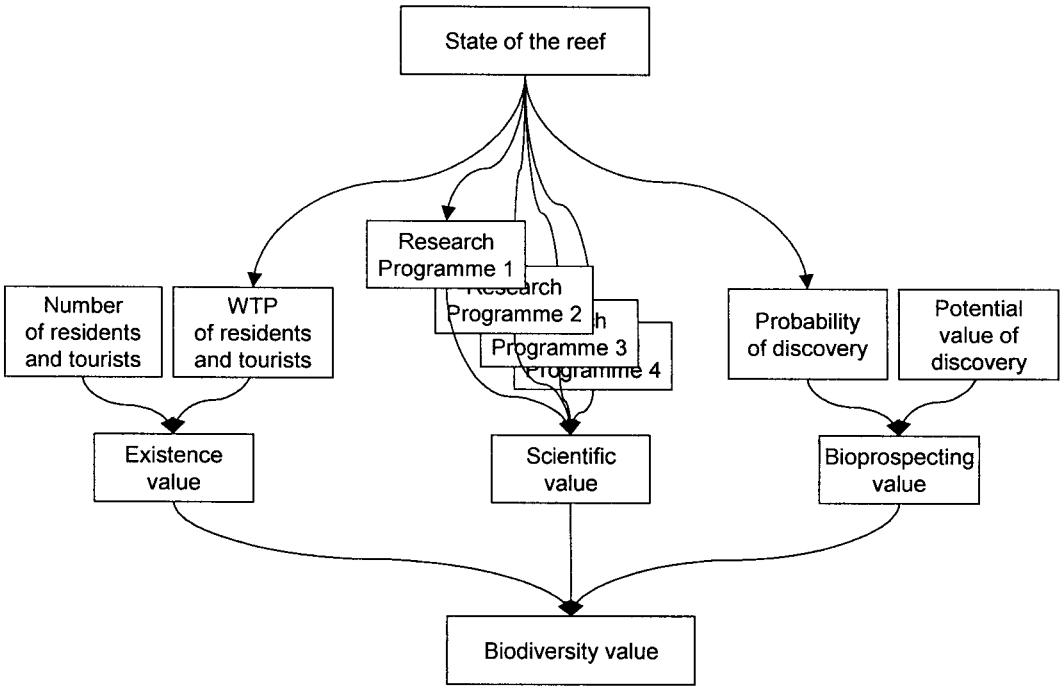

FIGURE 6. Biodiversity module.

BIODIVERSITY MODULE. The existence of a great number of endemic species makes the Hawaiian coral reefs a unique natural resource. This reef biodiversity aspect generates economic benefits. Figure 6 shows the main components of the so-called biodiversity module. These include the scientific or research value, the nonuse value, and the bioprospecting value.

The bioprospecting value refers to the revenues pharmaceutical companies may be able to retrieve from the diverse genetic pool contained by the Hawaiian coral reef. Because no company is currently active in this field, we do not consider this value for the Hawaiian context.

The research value is determined in a rather straightforward manner. All research budgets that are assigned to coral reef ecosystems in Hawai'i are included in this value category. To this end, a brief survey was performed in Hawai'i to determine the annual budget for reef-related research in 2001.

Nonuse values are based on the fact that people are willing to pay some amount of money for a good or service they currently do not use or consume directly. In the case of the Hawaiian coral reefs they are currently not visitors, yet they derive some benefit from the knowledge that the reef exists in a certain state and are willing to pay a certain amount of money to ensure that actions are taken to keep the reef in that state. The nonuse data applied here are discussed in this issue by Cesar and Van Beukering (2004).

Case Studies

Two case studies were selected within the region of the main Hawaiian Islands. Criteria that were used for the selection are both practical and more economic. Practical criteria include the location (i.e., even distribution among the Islands), the reef type (i.e., variation of ecosystems), type of threats (i.e., variation of threats addressed [see individual case

studies]), data availability (i.e., how to access the data), and representativeness (i.e., can the case studies be used for extrapolation Hawai'i-wide). Economic criteria refer to whether the case studies address a range of benefits such as snorkeling, diving, fisheries, coastal protection, and biodiversity. The selected case studies were at Hanauma Bay (O'ahu), addressing tourist overuse, and the Kīhei coast (Maui), addressing excessive nutrients and algae blooms.

TOURIST OVERUSE AT HANAUMA BAY, O'AHU. Hanauma Bay is the remnant of the inside of a large volcano, whose crater partly collapsed into the sea. The bay is located southeast of Waikīkī on O'ahu and is one of the most heavily used marine reserves in the world. The Hanauma Bay Marine Life Conservation District (MLCD), established in 1976, was the first MLCD in Hawai'i. Reef monitoring showed an average coral cover of 25.8% at 3-m depth and 27.0% at 10-m depth. Macroalgae coverage was very low, at around 2%, and percentages of crustose coralline algae and turf algae were high. Fishes were abundant, with densities of 417 fishes per 125 m^2 at 3 m and 630 fishes per 125 m^2 at 10 m.

In the late 1980s, Hanauma Bay was being almost "visited to death," with 13,000 visitors a day at peak times. These crowds stirred up sediment, disturbed and trampled the coral and algae, dropped trash, fed the fishes, and left a slick of suntan lotion on the bay's surface. To decrease these impacts, the number of visitors was reduced by limiting the entry of cars to the parking lot. Also, a Hanauma Bay Educational Program (HBEP) was set up to improve the marine awareness of visitors. A $3 admission fee is charged to non-Hawai'i residents over the age of 13, as well as a $1 parking charge per car. These fees, together with shop concessions, give Hanauma Bay a solid financial base.

ALGAE BLOOMS ON THE KĪHEI COAST, MAUI. Algae blooms have been a recurring problem on reef flats off the southern and western coasts of Maui for many years. This has caused substantial, but localized, disturbance to the beach front, in terms of both its unattractive appearance and unpleasant odor. Potential contributing factors include wastewater discharge, leaching of injection wells, storm water and agricultural runoff, and golf course runoff. This leads to nutrient enrichment of the shallow reef area, which can cause phytoplankton blooms. These blooms limit the amount of sunlight reaching stony corals, thereby affecting their health. The major algal blooms occur in the North Kīhei area, which has an algae cover of over 50%. Algae cover in South Kīhei, which has not had such problems, is estimated at around 5%. The North Kīhei algae problem is both a costly nuisance and a direct biological threat to local coral resources.

RESULTS

The results of the two case studies have two dimensions. On the one hand, the case studies involved elaborated field surveys aimed at revealing a particular economic aspect (i.e., tourist value, amenity value) of the coral reef at that site. This survey generated a snapshot of a particular value at a particular time (see Field Survey under each case study). Next, the possible changes of these values over time were simulated with the SCREEM model. The results of this exercise are presented in Scenario Analysis under each case study.

Hanuama Bay

FIELD SURVEY. Little is known about the behavior and perception of divers and snorkelers in Hawai'i. Tabata and Reynolds (1995) reported on the diving industry in 1990 from a macro perspective. The profile of divers and snorkelers in Hawai'i has never been systematically studied. To fill this gap, a survey was conducted in late 2001 and early 2002. Cesar et al. (2002) provided a full overview of the survey. The main purpose of the survey was to determine the average profile of each user group in terms of actual expenditure directly attributable to the diving or snorkeling trip, the consumer surplus for this experience, and the willingness to pay for a healthier marine environment.

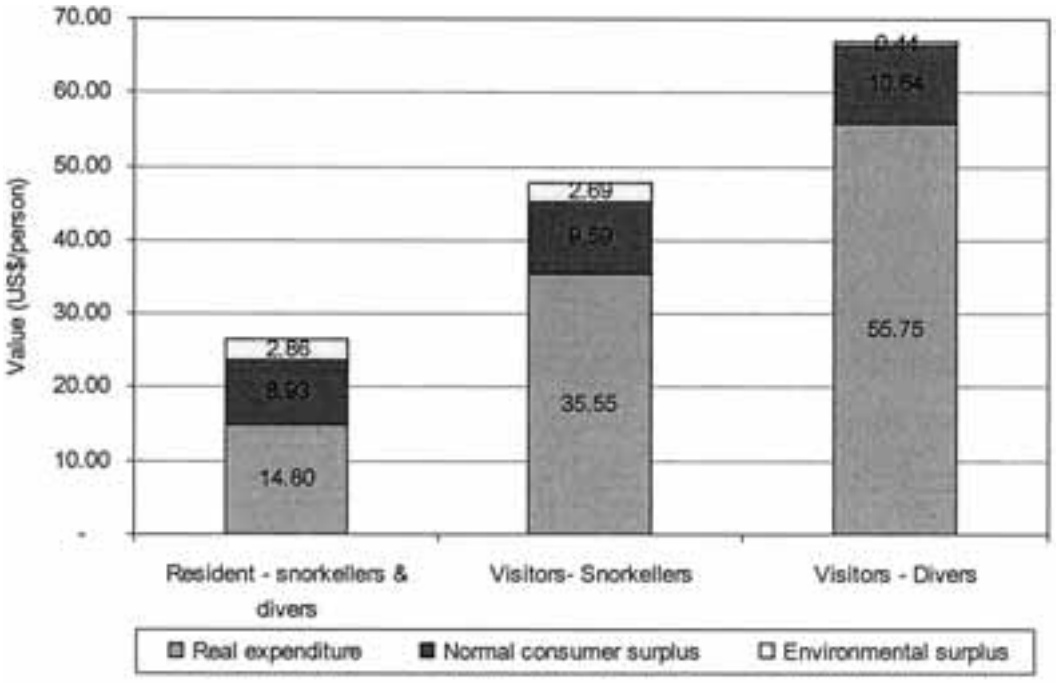

FIGURE 7. Allocation of real expenditures, consumer surplus for the same experience, and the surplus payment for a better marine environment.

The sample population was the active user group of coral reefs in Hawai'i. In total 50 divers and 260 snorkelers were interviewed. In addition, 150 nonusers were surveyed using a short version of the interview to investigate differences in perception between users and nonusers. At Hanauma Bay 152 interviews were conducted. Of these, 97 surveys were self-administered (i.e., respondents were handed surveys that they filled out and returned to the interviewer). Further details on the content of the survey are provided in this issue by Cesar and van Beukering (2004).

The results of this evaluation are shown in Figure 7. The real expenditures provide a predictable pattern. Residents generally spend much less on their dive or snorkel because they often have their own gear and also have less transportation costs to access the site. The consumer surplus for the same experience, without any environmental changes, is also largely as expected. Figure 7 shows that these are proportional to the real expenditures of the different user groups.

To determine the environmental component of the willingness to pay question, the consumer surplus was subtracted from the willingness to pay value obtained for a healthier marine environment. The surprising result is that the environmental component is much larger for the snorkeler ($2.69 per snorkeling trip) than for the diver ($0.44 per dive). One would expect the more advanced diver to have a higher willingness to pay to protect the marine environment than the snorkeler. An explanation for this surprising result is that divers already have high costs and may therefore be less willing to increase their expenditures solely for the sake of marine conservation. Another explanation is that divers, who are generally more acquainted with marine protection than snorkelers, are more skeptical about the effectiveness of marine conservation programs. Residents have a

relatively high willingness to pay for marine conservation ($2.86), most likely because they feel more affiliated with their own reefs than the visitors do.

Next, the interviewer asked the respondents whether it is reasonable to insist that scuba divers and snorkelers pay a fee for marine preservation. Only 22% of the respondents felt that it was not the responsibility of the users of the coral reef to keep it in proper shape. They felt it was a responsibility of the state to do this. The majority of the respondents, however, felt that divers and snorkelers should also, in one way or another, be held responsible for the costs of marine conservation, thereby supporting the polluter pays principle. Typically, from the response of the subgroups, divers are more reluctant to take responsibility than snorkelers. One of the reasons for this reluctance is that they perhaps feel that their contribution to the overall problem of reef degradation is limited.

In summary, the survey shows that the users of corals reefs in Hawai'i, and Hanauma Bay in particular, are willing to pay much more for their diving or snorkeling experience than they are currently doing. The argument that implementing a user fee or increasing a user fee by a limited amount (e.g., $1 or $2 per experience) would discourage the user from pursuing their activities therefore seems unjustified. In fact, many users feel that it is reasonable to ask for a contribution from the users because they are also partly responsible for the damage done to the reef. The admission fee to Hanauma Bay could therefore be even as high as $10 without having a notable impact on visitor numbers. However, from the viewpoint of equity such a high entry fee may be less desirable.

SCENARIO ANALYSIS. The main goal of the Hanauma Bay case study was to determine the value of the reef at Hanauma Bay and to evaluate the effectiveness of the investment in the education center there in terms of costs and benefits. To answer these questions, the SCREEM model was applied. When determining the value of coral reefs at Hanauma Bay, the main question is what future conditions to take into account. The economic value with a specific intervention, such as the implementation of a compulsory education program, is most likely to be very different than the value without an intervention. Therefore we analyzed two distinct scenarios:

(1) With education: The visitors to Hanauma Bay pay their entry fee, pass the education stands, and watch a compulsory short film that describes the coral reefs in Hawai'i and explains how visitors can help to minimize their impacts on the reefs. It is anticipated that physical damage and fish feeding will be considerably less in this scenario.

(2) Without education: The visitors to Hanauma Bay pay their entry fee but bypass the education stands and are not exposed to the film about coral reefs. Physical damage to the reef caused by standing on the reef and fish feeding will continue to occur.

The main economic effects in the Hanauma Bay case study are (1) an increase in satisfaction of visitors to the bay, (2) the positive fishery spillover effect, (3) an increase in biodiversity value derived from a healthier coral reef, and (4) the so-called education spillover effect. This education spillover effect refers to the fact that the snorkelers and divers of Hanauma Bay go snorkeling on average at two or three other locations in Hawai'i and therefore also behave better in those other reef areas. Education thus not only benefits Hanauma Bay itself but also prevents physical damage to other reefs. The education therefore can be considered a long-lasting investment in environmental awareness and tourist behavior. Most critics of the education center generally ignore this effect and tend to look only at the effects that education has in Hanauma Bay itself.

In calculating the educational spillover effect, a distinction is made between residents and visitors. As far as visitors are concerned, active visitors snorkel on average 3.8 times during their stay in Hawai'i, of which one snorkel trip will be in Hanauma Bay. The education spillover effect for active visitors is therefore assumed to materialize in approximately two snorkeling trips outside Hanauma Bay. Accounting for this spillover effect we adopted the calculations reported in Cesar et al. (2002) on threats to the reefs of a damage

TABLE 1

Recreational Benefits of the Different Users of Hanauma Bay (in $)

Type of Visitors	Aggregate Consumer Surplus	Direct Expenditure Attributed to Hanauma Visit	Indirect Expenditure Attributed to Hanauma Visit	Multiplier Effect	Total Recreational Value
Residents	1,097,550	708,750	—	177,188	1,983,488
U.S. West	1,542,952	1,891,360	3,263,496	1,288,714	7,986,521
U.S. East	1,322,652	1,621,315	3,565,484	1,296,700	7,806,151
Japan	1,202,725	1,474,309	2,459,600	983,477	6,120,111
Canada	236,093	289,404	707,163	249,142	1,481,802
Europe	225,881	276,886	582,582	214,867	1,300,217
Other	764,030	936,553	1,926,471	715,756	4,342,810
Total	6,391,883	7,198,577	12,504,796	4,925,843	31,021,099

rate of 2 cm^2 per trip. In the case of residents, it should be realized that active residents, who indicated snorkeling on average 10 times a year, will continue doing so for many future years. In other words, the accumulative effect of their education is much larger than for visitors. Calculations show that improved behavior of snorkelers results in less reef change (4 ha) than would otherwise take place. For divers, a damage reduction of approximately 0.2 ha is estimated.

Besides "educational spillovers" other forms of positive leakage may occur from Hanauma Bay. Some experts consider the bay as a "sacrificial site" within the overall system of Marine Protected Areas in Hawai'i. They believe that the degradation is acknowledged as being beyond the "optimal level" on a single site basis but that the resultant revenues are then adequate to fund the entire island's park system and provide protection in pristine areas where such protection might not otherwise be possible. This sort of "system" approach is becoming more common in network planning of Marine Protected Areas (see Morris 2002). We have ignored such spillover effects outside Hanauma Bay.

The findings of the survey were used in the analysis to calculate the recreational benefits of Hanauma Bay. The first step in this procedure was to identify the true user group of the coral reef of Hanauma Bay. After all, not all visitors actually go snorkeling or diving and are therefore not necessarily benefiting from the reef as such. The survey revealed that the most active users were Europeans, of whom 95% went snorkeling or diving. The least-active user groups were the Japanese, of whom only 60% actually put their head under water. The total number of users is estimated to be over 800,000 people.

Next, calculations were made of how much value can be attributed to this marine activity. We took into account four categories. First, we measured the welfare gain of the visitors by determining the consumer surplus. Second, we included the actual expenditure directly related to a snorkeling or diving experience. Third, we considered a share of the expenditure indirectly related to the marine experience, such as hotel costs and travel costs. Fourth, we adopted the multiplier effect developed by the Department of Business, Economic Development, and Tourism (2002) of 1.25 for the overall economy. These different categories are reported in Table 1.

Figure 8 shows the aggregated benefits consisting of the recreational values, the education spillover effects, the biodiversity values, and the fisheries spillover effect. Due to the further degradation of Hanauma Bay, if no proper education program is established, the value of Hanauma Bay will decrease slightly to $35 million in 2050. This decline is caused mainly by the reduction of the consumer satisfaction of the visitors. In the "with education" scenario, the value of Hanauma Bay can increase substantially, mainly due to

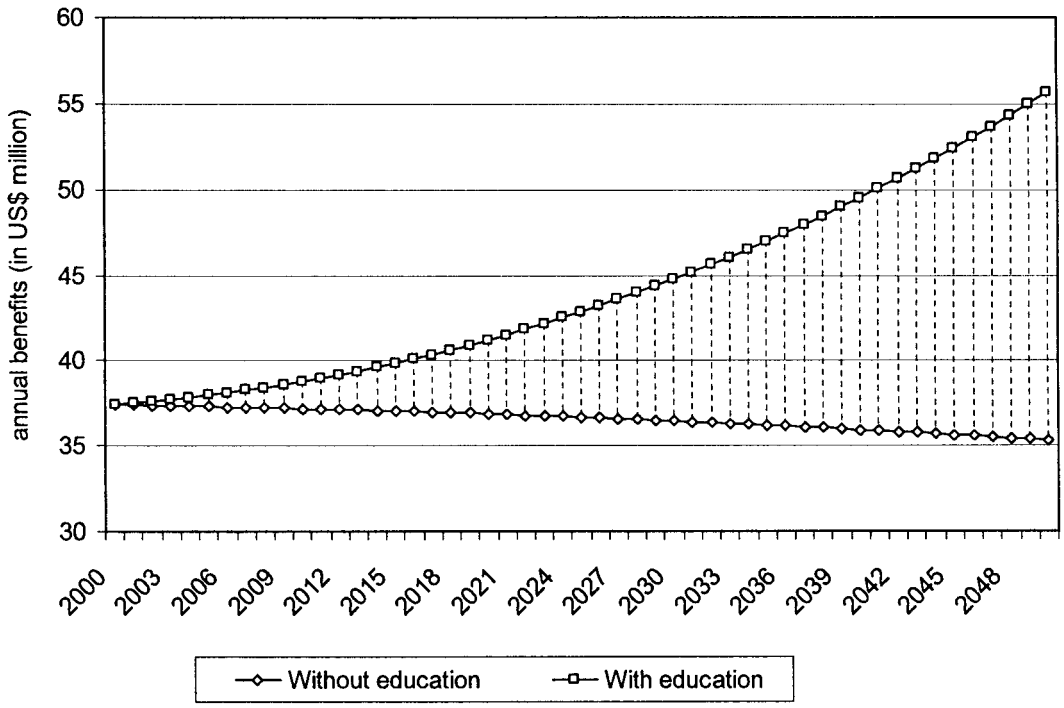

FIGURE 8. Annual benefits "with" and "without" education at Hanauma Bay.

its educational role for general coral reef use in Hawai'i. The area between the "with education" and "without education" scenarios represents the cost of inaction. At a discount rate of 4% this area representing the net benefits of education is valued at $100 million. The composition of this amount is determined by the increased satisfaction of visitors to the bay (33%), an increased biodiversity value derived from a healthier coral reef (4%), and the education spillover effect (63%).

The additional costs of the education program aggregate over time to $29 million at a discount rate of 4%. This is far less than the $100 million net benefits just mentioned generated by the education program. In other words, because the benefit cost ratio at a 4% discount rate of 3.5 greatly exceeds 1, the investment in the education program can be considered economically feasible. Only at a discount rate of more than 12% does the benefit cost ratio become less than 1. Under those conditions, the project is no longer economically feasible. It should be realized, however, that besides economic motives there may exist other reasons, such as purely ecological or social ones, to pursue the education program.

The composition of the net benefits is as follows (Figure 9): value of increased satisfaction of visitors to the bay (33%), an increased biodiversity value derived from a healthier coral reef (4%), and the so-called "education spillover effect" (63%). The latter comes from reduced coral trampling elsewhere by residents and tourists after watching the obligatory Hanauma video.

Kīhei Coast

FIELD SURVEY. The Kīhei coast survey addressed two issues. First, an assessment was made of the damage costs for various stake-

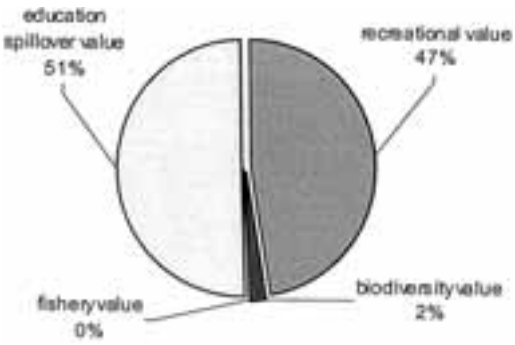

FIGURE 9. Allocation of benefits of an education program at Hanauma Bay.

holders related to the algae problem. Second, the potential remediation costs of the algae problem were examined.

The macroalgae problem on the Kīhei coast has a negative impact on property values of the affected condominiums as well as the rental prices and vacancy rates in transient accommodations. To study this impact a survey was conducted in early 2002 that compared economic parameters of the ocean-front condominiums in North Kīhei that are affected by chronic algae problems with the experience of comparable, but unaffected, condominium complexes in South Kīhei. This comparison is difficult for several reasons. First, although the North Kīhei algae impact area is readily identified, not all condominium complexes within that area are affected equally throughout the year. Moreover, fluctuations per year are higher than those assumed in the model. In short, we measured the relatively long-term economic effects of the algae problem in North Kīhei. In particular, we concentrated on the difference in room rates, occupancy rates, and property values.

Room rates: As part of the survey, data were collected on daily (transient) room rates at 15 relatively large condominium properties that contained 745 units. Tax information was obtained only from ocean-front condominiums because these properties are most likely to be affected by the algae problem. Although data were collected on a variety of accommodations (e.g., studio, one bedroom, two bedroom, three bedroom, etc.), not all properties offered all options. To simplify the analysis, a one-bedroom unit was used as the basis for comparison. The room rate used was the lowest published ("rack") rate in effect on 1 May 2002.

The room rate comparison clearly suggests a substantial difference in the room rates of condominiums in the "algae zone" of North Kīhei from similar-sized condominiums in the southern "nonalgae" zone. This differential is most evident in the comparison of two nearly identical "sister" properties: the Menehune Shores and the Royal Mauian. These complexes are architecturally identical, and units in each project have the same floor space and layout. The one-bedroom units in the algae-zone Menehune Shores rent for slightly less that two-thirds the rates commanded by identical units in the Royal Mauian.

Occupancy rate: It is difficult to develop quantitative data on the occupancy rates of condominiums because condominium owners (or their guests) are constantly taking up or leaving residence in their own units. Thus, the rental pool is constantly changing. Furthermore, unlike hotels, the marketing of condominium rentals relies less on organized advertising or sales networks and more on word of mouth and return business or information channels such as guidebooks or internet sites. The situation is further complicated, because unit owners in a given complex may elect to self-rent their apartments as an alternative to having their units managed by a local rental management company. For example, one of the largest condominium complexes in the algae zone is the Maui Sunset. The property has over 216 units and rental marketing is handled by six agencies. In addition, numerous units are directly rented by owners.

Rental agents and owners who were interviewed from the "algae zone" properties were unanimous in the belief that they suffered lower occupancy rates due to the algae nuisance. It is interesting that there seemed to be a common belief that vacancy rates were between 5 and 10% lower in the algae area

TABLE 2

Comparison of Sale Prices of One-Bedroom Units in the Menehune Shores and the Royal Mauian Condominium Complexes for 1998–2000

Year	Menehune Shores		Royal Mauian		% Difference in Sales Price
	No. of Sales	Average Price	No. of Sales	Average Price	
1998	6	156	3	440	182
1999	21	194	3	382	97
2000	12	222	8	495	123
Average 1998–2000	194	190		439	131

Source: Hawai'i state tax records.

than in similar properties in South Kīhei. Although such estimates are subjective and anecdotal, they do reflect the professional opinion of rental agents who manage units both inside and outside the algae problem area.

Private property values: The market value of a real estate unit comprises many tangible and intangible factors related both to the condition of the unit and to its location. The algae problem is a real factor in the price of condominium units in the North Kīhei area. Everyone seems to accept that the algae problem makes North Kīhei condominiums less attractive and less valuable. There are two interrelated aspects to this property value impact. First, the algae nuisance makes units less attractive as residences. Second, the algae nuisance lowers property values by reducing the income-producing capacity of the units as rentals (i.e., lower rental rates + lower occupancy).

Due to resource constraints, estimates in this survey were based on a simplified statistical analysis only and not on the hedonic pricing method. To develop an estimate of the impact of algae on property prices, tax records for 771 units in North and South Kīhei were analyzed for the period 1998–2000.

This comparison clearly shows a substantial difference. Though we were not able to prove this statistically, it is assumed that this can be attributed at least partly to North Kīhei's algae problem. However, there are so many variables potentially affecting property values that the estimates probably need some refinement. To eliminate differences in property values that might be associated with basic design, as well as apartment and complex amenities, we compared sales prices for the sister properties Menehune Shores and Royal Mauian. These properties are, in terms of architecture, design, and amenities, largely identical. The details of this comparison are presented in Table 2.

From this comparison of nearly identical properties, it is clear that one-bedroom units in the algae zone (e.g., the Menehune Shores) were, over the 3-yr study period, only about 43% as valuable as one-bedroom units at the Royal Mauian. Clearly, the location of the two complexes had a very substantial influence on the value of the units. If we assume that the average price difference seen in the Royal Mauian–Menehune Shores comparison is representative of property differentials between the algae and nonalgae areas, then condominium owners in the algae area are experiencing a substantial depreciation of the value of their properties. Though we were not able to prove this statistically due to data constraints, interviews with condominium owners and managers clearly indicated that the algae problem was the single most important determinant of the price differential.

The major condominium properties in the algae zone have undertaken a privately funded beach cleanup program for a number of years. This program involves periodic (daily during peak seasons) collection of algae using traditional construction equipment.

The collected algae is either bulldozed into shore berms along the beachfront or stacked into piles in front of the Maui Sunset complex. The stacked algae is collected by Maui County trucks as the need arises and hauled to local composting sites for recycling. The algae cleanup and removal operation is mildly controversial because the removal of beach sand is an inevitable part of the current process. The Maui County Public Works Department is in the process of buying a beach cleanup machine that will minimize sand removal and algae handling. The beach cleanup operation is undertaken by a private contractor at an annual cost to the condominiums of $55,000.

SCENARIO ANALYSIS. As mentioned, the main goals of the Kīhei coast case study were to determine the value of the reef on the Kīhei coast, and to evaluate the effectiveness of interventions that aim to reduce the nutrient outflow in the Kīhei coastal waters in terms of net benefits. For this purpose the SCREEM model was applied. We analyzed economic values in this assessment under two distinct scenarios:

(1) With nutrient reduction: Several measures will be taken that are aimed to reduce the nutrient outflow into Kīhei waters. These include the upgrading of the Kīhei sewage plant from secondary to tertiary treatment, and improved fertilizing practices in both the agricultural sector and the golf courses. Because current knowledge in this field is still insufficient we need to make a number of assumptions with regard to the effectiveness of these measures. This is explained later in this section.

(2) Without nutrient reduction: No nutrient reducing measures will be taken. This implies that the current trends of algae blooms will continue to occur, leading to further coral reef destruction and continued algae nuisance at Kīhei beaches.

The coral reefs at Kīhei serve various purposes. Figure 10 shows the composition of the main benefits. The most important economic benefits of the coral reefs on the Kīhei coast are the recreational and amenity values. The recreational benefits consist mainly of snorkelers that independently visit the reefs offshore (29%). The majority of the economic benefits of the coral reefs consist of amenity benefits derived from the differences in property values of houses, hotels, and condominiums at healthy and unhealthy coral reefs (65%).

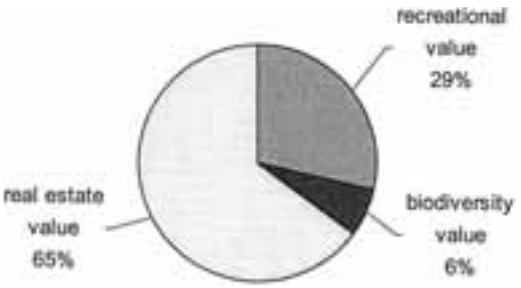

FIGURE 10. Allocation of main benefits if nutrient reductions are achieved.

Figure 11 depicts development of the annual benefits derived from the coral reefs for the scenarios with and without nutrient reduction. It is not surprising that the annual benefits will further decline from $25 million to $9 million in a situation where the coral reefs will gradually disappear and where algae blooms will continue to occur. In a situation where nutrients are successfully reduced, however, the annual benefits will eventually increase by almost $30 million. The majority of this increase is attributed to the growth in property values. In other words, if appropriate measures are taken, it will take approximately 50 yr before the damage caused so far by the algae blooms on the Kīhei coast is completely eliminated. Due to the delay between the time of the interventions (e.g., sewage upgrade, fertilizer improvement) and the actual reduction of the nutrient levels in Kīhei waters, the annual benefits will inevitably decline for another 10 to 15 yr before the reef will recover and the ecological effect will have materialized in economic benefits.

To get an idea of how the benefits of "action" (e.g., the shaded area between the two curves in Figure 11) compare with the cost of the required intervention, the cost of upgrading the sewage plant at Kīhei from secondary to tertiary treatment has been esti-

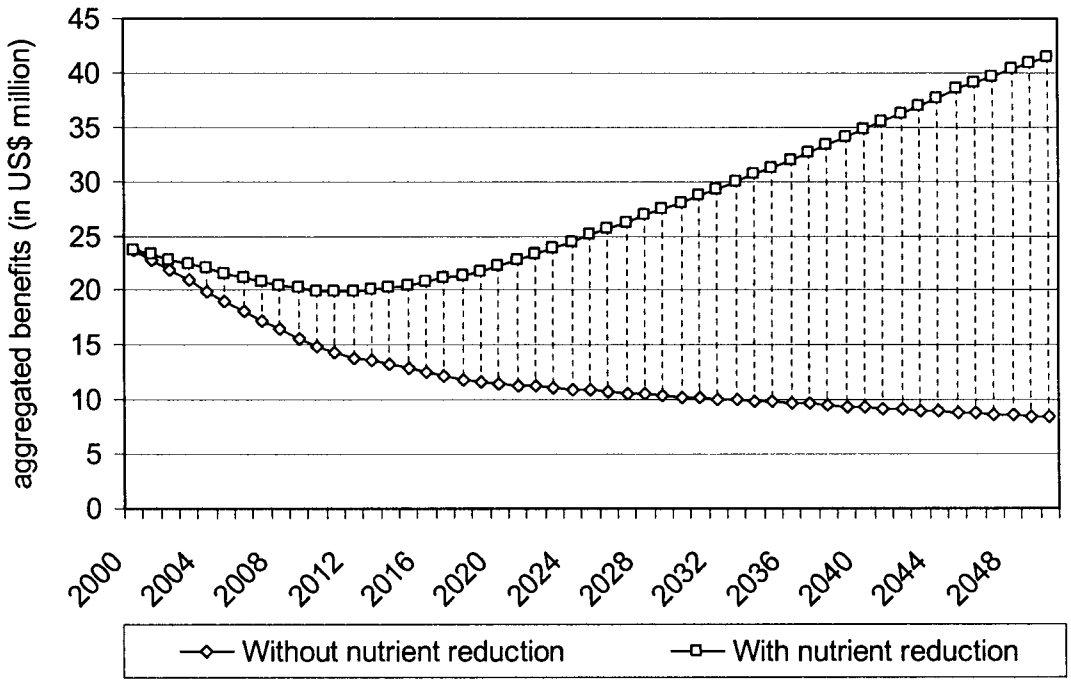

FIGURE 11. Development of benefits from the coral reefs with and without the reduction of nutrient levels on the Kīhei coast.

mated. We do not claim that this would include all the costs required to solve the algae problem at Kīhei, but it gives us at least some rough idea of the comparison between benefits and costs.

Beginning in 1995, Maui County started a long-term upgrading program for its sewage-treatment plants at Lahaina and Kīhei. The plan was designed to upgrade treatment from secondary to tertiary levels and explicitly recognized the nutrient and algae problem. As part of this plan the county commissioned the Brown and Caldwell consulting company to study rate and fee alternatives for reclaimed water service. The study examined the costs of upgrading sewage effluents to levels that would be suitable for selling reclaimed water to a number of identified users. The study estimated the annual costs of the upgrading scheme to be slightly over $2.3 million per year.

A sensitivity analysis was conducted for the relationship between the total economic value and the discount rate. For all discount rates tested, the benefit cost ratio exceeds 1, implying the cost-effectiveness of the intervention. Two remarks are made concerning this conclusion. First, as mentioned, sewage treatment upgrading is only part of the problem and may therefore not be sufficient to solve the algae problem. The costs will therefore most likely be higher than assumed in this analysis. Second, the benefits taken into account are only those that relate directly to coral reefs. In reality, a number of site benefits will be achieved, such as health effects and water savings, that have not been taken into account in this study and that are often the sole reason to upgrade sewage systems. The benefits considered are therefore an underestimation of the real societal benefits that will occur.

DISCUSSION

The mutual relationship between ecological and economic processes of coral reef ecosystems is strong. Therefore, a multidisciplinary approach is essential in tackling the multiple threats that currently face the fragile coral reefs of Hawai'i. SCREEM is a first attempt to provide a platform for marine biologists and environmental economists to exchange knowledge on the degradation and management of the coral reefs of Hawai'i. Some would like to see more complex interrelationships in the model. Indeed, we acknowledge that the model is rather straightforward. Yet it provides a representation of the current state of the scientific knowledge available in the literature, even though the model simulations are far from accurate and sometimes lack the desired level of comprehension. Moreover, unlike most monodisciplinary studies, SCREEM contains the main elements required to oversee the full picture of coral reef management and thereby enables scientists and managers to evaluate ecological and economic impacts effectively.

Several conclusions can be drawn from the study at Hanauma Bay: (1) visitors to Hanauma Bay are willing to pay much more for their experience ($10) than they are currently doing. This consumer surplus is even larger if they know this payment is used for conservation ($12.50); (2) divers are less willing to contribute to conservation than snorkelers, (perhaps) because of their high expenditures or their skepticism about its effectiveness; (3) the education spillover effect dominates the economic value of the bay; and (4) the net benefits of the education program ($100 million) over time greatly exceed the cost of the program ($23 million) over time.

The Kīhei coast study is incapable of revealing the full picture of the associated costs and benefits of the algae problem. To address these issues appropriately, more geological, hydrological, ecological, and economic information is required. This can only be achieved with the help of a multidisciplinary team and with more research funds. Despite these handicaps, an attempt was made to come up with a rough estimate of the economic values related to the coral reefs and the algae problems and to compare these with an estimate of the costs of upgrading the sewage plant in Kīhei. Several conclusions have been drawn: the losses of real estate value and hotel business are the main effects of the algae problem at Kīhei; and it seems that the costs of reducing nutrient concentrations are smaller than the loss of benefits in the algae problem.

The two case studies show the costs and benefits of coral reef management. Expressing the various elements in economic terms can help policy makers to better understand the trade-offs involved in coral reef management and the costs associated with a policy of "inaction," thereby providing arguments for the State of Hawai'i to reconsider its extremely low budget allocation for coastal zone management compared with other states.

ACKNOWLEDGMENTS

We thank Mike Hamnett, Kristine Davidson, and Risa Minato of the Hawai'i Coral Reef Initiative Research Program for their support. Funding from NOAA's Coastal Ocean Program for the study and from the Institute for Environmental Studies at the Vrije Universiteit in Amsterdam for the write-up of the paper is gratefully acknowledged. We also thank John Dixon for helping to set up the study and Sam Pintz for his Kīhei work. Constructive comments by Jack Ruitenbeek and Alan White have improved the paper considerably. The usual caveats apply.

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COMMITTEE ON FINANCE
Representative Sylvia Luke, Chair
Representative Ty J.K. Cullen, Vice Chair

Friday, February 23, 2018, 2:00 p.m., Conference Room 308

HB2626 HD1– Relating to Cesspools

TESTIMONY

Nancy Davlantes, Legislative Committee Member, League of Women Voters of Hawaii

Chair Sylvia Luke, Vice-Chair Ty Cullen, committee members:

The League of Women Voters of Hawaii has previously supported HB2626 HD1 and urges the necessary funds be allocated. This bill would require the Department of Health to hire a third-party consultant to conduct a study on the issues relating to the upgrade or conversion of cesspools. It would also establish the cesspool conversion working group to assist the third-party consultant on the study.

The League's approach to environmental protection and pollution control is one of problem solving, the goal aiming to prevent ecological degradation.

According to the state Department of Health, cesspools are a major source of pollution to Hawaii's waters. The approximately 88,000 cesspools in Hawaii discharge some 53 million gallons of untreated sewage into the groundwater every day. Groundwater flows into drinking water sources, and, since 95 percent of all drinking water in Hawaii comes from ground water sources, this cesspool pollution can potentially harm human health. Groundwater also flows into streams and the ocean, harming public health and the environment, including beaches, recreational waters, and coral reefs.

There is no question that Hawaii must work to find ways to convert or upgrade the thousands of cesspools in the state, including evaluating the feasibility and development of a grant program to fund cesspool upgrades statewide as soon as possible in order to protect the public health and environment.

The League urges you to pass and fund this bill.

Thank you for the opportunity to submit testimony.

HB-2626-HD-1
Submitted on: 2/21/2018 12:51:16 PM
Testimony for FIN on 2/23/2018 2:00:00 PM

Submitted By	Organization	Testifier Position	Present at Hearing
Jacqui Hoover	Hawaii Leeward Planning Conference	Support	No

Comments:

Hawaii Leeward Planning Conference (HLPC) a private, member-based 501(c)3 incorporated in 1974 whose 100+ members and affiliates are committed to sound planning and private-public partnerships, supports HB2626 HD1.

HLPC requests that the clarifications included and not limited to, defining "collaboration" as sought by the County of Hawai`i and other jurisdictions, be addressed.

Thank you for this opportunity to speak in support of HB2626 HD1,

HB-2626-HD-1
Submitted on: 2/22/2018 10:54:02 AM
Testimony for FIN on 2/23/2018 2:00:00 PM

Submitted By	Organization	Testifier Position	Present at Hearing
Bill Carpenter Jr	Envirocycle Cesspool Replacements	Support	No

Comments:

If the problem of land and water pollution caused by cesspools is to be solved it is time to completely reorganize Hawai'i Department of Health - Wastewater Branch (DOH-WWB) and fully revisit the truly arcane Hawai'i on-site treatment system regulations.

1. The DOH-WWB policy of replacing cesspools with septic systems does virtually NOTHING to solve the human waste pollution problem. Septic systems in Hawai'i do not effectively reduce pathogens (infection-causing bugs) or nitrates (a coral reef killing substance).

2. The DOH-WWB policy of requiring two fully-functioning drain fields is not necessary with modern technology and adds greatly to the consumer cost of a proper cesspool/septic system replacement.

3. The DOH-WWB policy of requiring two hundred gallons of treatment per bedroom per day is not in line with National norms and adds greatly to the cost of a technologically advanced cesspool replacement.

4. The DOH-WWB policy of not allowing the safe re-use of treated wastewater for underground drip irrigation of landscaping adds unnecessary cost to modern cesspool replacement systems.

5. The DOH-WWB policy of allowing only Hawai'i-registered engineers to design modern cesspool replacement systems blocks much-needed talent and reduces the sheer numbers of women and men needed to efficiently tackle the tremendous task of replacing Hawai'i's 88,000+ cesspools.

6. The DOH-WWB policy of allowing only Hawai'i-registered engineers to design technologically advanced cesspool replacement systems dramatically increases the cost to the Hawaii consumer to replace cesspools due to limited competition.

7. The DOH-WWB policy of requiring commercial/industrial grade construction and testing of residential cesspool replacement systems over 1,000 gallons per day is greatly out of line with National norms and adds tremendously to the cost of a low-cost technically advanced cesspool replacement system.

8. The DOH-WWB policies of discouraging (or outright blocking) new technologies that can cost-effectively solve the cesspool pollution problem must be investigated and eliminated.

9. DOH-WWB public employees must be required to receive continuing education in the art of on-site wastewater treatment to keep their jobs. A huge obstacle to solving the cesspool pollution problem has been the ineffective management within DOH-WWB, lack of "out of the box" thinking by employees of the DOH-WWB, and a the tendency to "play favorites" with certain system designers, contractors, and system manufactures to keep the status quo-- to the detriment of the citizens, land and sea animals & plants, and the coastal and fresh waters of the Hawai'ian Islands.

10. As proof of the systematic problems within the DOH-WWB, the US EPA needed to step in to regulate and help solve the enormous human waste pollution caused by Hawai'i Large Capacity Cesspools because DOH-WWB could not effectively do so.

The Envirocycle Cesspool Replacement System for Hawai'i was invented to cost effectively solve Hawai'i's cesspool pollution problem. It allows the 100% safe reuse of the clear and odor free treated water for landscape irrigation and toilet flushing. This modern cesspool replacement system fits in approximately the same square footage as a cesspool and can be used above or below ground. It uses the same amount of electricity as a medium size refrigerator. Two United States patents have been issued for the technology and this technology has been certified TWICE by University of Hawai'i at Manoa Water Resources Research Center to meet and be better than the on-site treatment system de facto National treatment standards as well as US EPA treatment standards. The Envirocycle Cesspool Replacement System is one-half the price of typical cesspool replacement products in Hawai'i. Low interest rate Federal government backed loans are currently available to Hawai'i residents to buy Envirocycle Cesspool Replacement Systems.

Without addressing the DOH-WWB policy and personnel problems mentioned in the 10 points above, no law drafted or passed, or incentive ever presented by the Hawaii Legislature will be enough to allow the citizens of Hawai'i to solve this horrific third-world human excrement cesspool poisoning of the Hawai'i 'Aina and Wai.

With Aloha,

Bill Carpenter Jr.
Inventor
Envirocycle Cesspool Replacement System for Hawai'i
808-792-1220
bill@envirocycleglobal.com

HB-2626-HD-1
Submitted on: 2/22/2018 1:41:04 PM
Testimony for FIN on 2/23/2018 2:00:00 PM

Submitted By	Organization	Testifier Position	Present at Hearing
Melodie Aduja	Individual	Support	No

Comments:

PRESENTATION OF THE

OAHU COUNTY COMMITTEE ON LEGISLATIVE PRIORITIES

DEMOCRATIC PARTY OF HAWAI'I

TO THE COMMITTEE ON FINANCE

THE HOUSE OF REPRESENTATIVES

TWENTY-NINTH LEGISLATURE

REGULAR SESSION OF 2018

Wednesday, February 23, 2018

2:00 p.m.

Hawaii State Capitol, Conference Room 308

RE: Testimony in Support of HB 2626 HD1 RELATING TO CESSPOOLS

To the Honorable Sylvia Luke, Chair; the Honorable Ty J.K. Cullen, Vice-Chair, and Members of the Committee on Finance:

Good afternoon. My name is Melodie Aduja. I serve as Chair of the Oahu County Committee ("OCC") Legislative Priorities Committee of the Democratic Party of Hawaii. Thank you for the opportunity to provide written testimony on House Bill No. 2626 HD1 relating to Cesspools; Working Group; Study; and an appropriation.

The OCC Legislative Priorities Committee is in favor of House Bill No. 2626 HD1 and supports its passage as it requires the Department of Health to hire a third-party consultant to conduct a study on the issues relating to the upgrade or conversion of cesspools and establishes the cesspool conversion working group to assist the third-party consultant on the study.

House Bill No. 2626 HD1 is in accord with the Platform of the Democratic Party of Hawai'i ("DPH") which provides that "[w]e support the protection of our 'aina against destruction by corporate, government, or military usage and expect full restoration and reparation of environmental damage. To handle current and future demands for water, we must assess the current condition of our aquifers and take appropriate actions to secure our fresh water resources.

We support democratic participation of citizens and residents to protect (I) valuable coastal ecosystems and reefs from misuse and (ii) beaches for public use and recreation. The Hawai‘i Coastal Zone Management (CZM) law, HRS Chapter 205A, currently provides for public participation in management of coastal resources.

We believe in the vigorous enforcement of our environmental laws and increased public-private stewardships and citizen involvement in protecting our resources. (Platform of the DPH, P.8, Lines 422-433 (2016)).

Given that House Bill No. 2626 HD1 requires the Department of Health to hire a third-party consultant to conduct a study on the issues relating to the upgrade or conversion of cesspools and establishes the cesspool conversion working group to assist the third-party consultant on the study, it is the position of the OCC Legislative Priorities Committee to strongly support this measure.

Thank you very much for your kind consideration.

Sincerely yours,

/s/ Melodie Aduja

Melodie Aduja, Chair, OCC Legislative Priorities Committee

Email: legislativeprorities@gmail.com, Tel.: (808) 258-8889

HB-2626-HD-1
Submitted on: 2/22/2018 10:17:00 AM
Testimony for FIN on 2/23/2018 2:00:00 PM

Submitted By	Organization	Testifier Position	Present at Hearing
George Fry	Individual	Support	No

Comments:

Please consider this bill, it is a problem that needs attention for our costal communities and the health of our waters. I think the value of clean costal waters is of tremendous importance to our state.

Mahalo, George Fry

Puako, HI

HB-2626-HD-1
Submitted on: 2/22/2018 11:02:06 AM
Testimony for FIN on 2/23/2018 2:00:00 PM

Submitted By	Organization	Testifier Position	Present at Hearing
Danielle Swenson	Individual	Support	No

Comments:

To: House Representative Chair Sylvia Luke, Finance Committee

Re: Support for HB 2626 HD1 Relating to Cesspools

Friday, February 23, 2018 2:00 pm

Conference Room 308

Dear Finance Committee,

Mahalo for consideration of this testimony. I support this bill in which will enable to state to further research technologies for the unique and varied landscape in our islands. A one stop solution is not realistic and it's great that this is acknowledged.

I live on the Big Island where as you know, we have many areas of high groundwater along the shoreline that don't seem to be a good fit for upgrading cesspools to septic or even aerobic systems. This bill would encourage more cost effective, diverse technologies to be available. I believe removal of sewage on our coastlines and treating away from the shoreline makes the most sense, but looking at best practices up mauka is also important. Especially when we have these storm events and several water quality notices are released about all of the bacteria in the water statewide.

One thing we desperately need is to sustainably finance wastewater infrastructure in the long term. It is sickening to continuously hear about old infrastructure that has failed and caused a sewage spill, etc....and find out how little folks pay for sewer fees (specifically here on the Big Island - county facilities).

I hope the advisory team for this bill is appropriate and has the expertise and open mind it will take to do this research to find the best answer dependent upon hydrology and geology of the various areas that are prioritized.

Thank you for the opportunity to provide testimony on HB 2626 HD1.

Sincerely,

Danielle Swenson

Kailua Kona resident

Harry Kim
Mayor

Wilfred M. Okabe
Managing Director

William A. Kucharski
Director

Diane A. Noda
Deputy Director

County of Hawai'i
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

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LATE

February 22, 2018

Rep. Sylvia Luke, Chair
Committee on Finance
State of Hawai`i House of Representatives
Hawai`i State Capitol
415 South Beretania Street
Honolulu, Hawai`i 96813

Re: **Support of HB2626 HD1 (Relating to Cesspools)**
Date: February 23, 2018 (Friday)
Time: 2:00 p.m.

Dear Chairperson Luke and Members of the Committee on Finance:

The County of Hawaii is in support of HB 2626 HD1 (Bill). The issue of cesspool closures and conversions is of utmost importance to the County of Hawaii and the projected costs are extraordinarily high. The Bill provides critical support to Hawaii Department of Health (HDOH) and the Counties of Hawaii. The Bill is designed to provide information that will make more informed decisions for the implementation of cesspool closures across the state possible. The potential value of this Bill cannot be underestimated. The types of information that the Bill will provide will be critical to identifying cost effective and technically appropriate cesspool closures. The last thing the State needs is to replace cesspools with new and expensive systems that do not resolve the environmental damage being done by cesspools. This Bill will go a long way in evaluating appropriate new replacement systems and help to identify those areas where required upgrades should first occur. The 12 tasks identified in the Bill to be addressed by the selected consultant and the working group are well thought out and comprehensive.

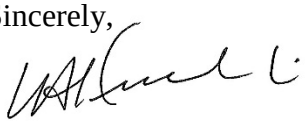
The working group created by the Bill (Section 2 (a)) is populated with State, County, private sector and University representation. The only improvement to the provided structure would be to provide, explicitly, a strengthened role for the working group. The only role currently provided is to "…work in collaboration…" (Section 2 (b)) with the selected contractor. A strengthen role, such as a requirement to approve any submitted draft reports before transmittal to the Legislature, as provided in Section 3, would improve the role and responsibilities of the working group. As written, there is no actual responsibilities or authorities of the working group specifically defined. Issues such as selection of the consultant and report review and approval would strengthen the role of the working group and this addition is recommended.

The County of Hawaii particularly supports task 4 of Section 1 (b). This task requires the consideration of the impacts of the cesspool closures on low income residents and requires the review and proposals as to how assistance can be provided to these residents. Especially for the County of Hawaii, this element of the Bill is appreciated and encouraged. Also, task 11 of Section 1 (b), which requires the evaluation of conditions that might allow exemptions from the upgrade requirements is appreciated. There are areas of the County that are believed to be devoid of any viable groundwater resource and requiring upgrades to systems to protect a resource that is not present or useable ought to be examined and exemption criteria developed.

The County of Hawaii is fully in support of HB 2626 HD1 and believes that this is appropriate exercise of State oversight and support. It satisfies a need that none of the Counties can provide individually, and also supports the obligations given to HDOH.

Thank you for your consideration of this testimony.

Sincerely,



William A. Kucharski, Director, Department Environmental Management, COH

LATE

HB-2626-HD-1
Submitted on: 2/22/2018 9:06:20 PM
Testimony for FIN on 2/23/2018 2:00:00 PM

Submitted By	Organization	Testifier Position	Present at Hearing
Rachel Rounds	Individual	Support	No

Comments:

The Twenty-Ninth Legislature
Regular Session of 2018

LATE

HOUSE OF REPRESENTATIVES
Committee on Finance
Rep. Sylvia Luke, Chair
Rep. Ty J.K. Cullen, Vice Chair
State Capitol, Conference Room 308
Friday, February 23, 2018; 2:00 p.m.

RELATING TO CESSPOOLS

The ILWU Local 142 supports H.B. 2626 HD 1, which requires the Department of Health to hire a third-party consultant to conduct a study on the issues relating to the upgrade or conversion of cesspools, establishes the cesspool conversion working group to assist the third-party consultant on the study, and appropriates funds.

H.B. 2626 HD 1 specifically provides that a Department of Health hired third-party consultant must conduct a study on "cesspool conversion," as required by Act 125, Session Laws of Hawaii 2017, and shall do so in collaboration with the newly established cesspool conversion working group. Areas of focus for the study include, but is not limited to:

- financing issues and the feasibility of various mechanisms, including grants, loans, tax credits, fees, special assessment districts, requirements for conversion at point of sale, and any other appropriate mechanisms for accomplishing and funding cesspool conversion, or any combination of these mechanisms;
- owners' ability to pay for cesspool conversions, especially how assistance can be provided for lower-income homeowners; and
- the most cost-effective approach to cesspool conversion.

The bill delineates the selection process for the working group and requires a report be submitted to the legislature by December 31, 2019. Furthermore, it provides a blank appropriation to conduct the study and ultimately sunsets on July 1, 2020.

The ILWU understands the very real water pollution concerns related to cesspools and generally supports the transition to appropriate wastewater treatment. We, however, believe it unreasonable to expect working class families trying to survive in Hawaii’s tough cost-of-living environment or retirees on fixed incomes in rural areas to do so without significant financial assistance.

As such, the ILWU urges passage of H.B. 2626 HD 1 to facilitate the review of wastewater treatment best practices and reasonable financing methods to ensure full compliance with Act 125, Session Laws of Hawaii 2017. Thank you for the opportunity to share our views on this matter.

Surfrider Foundation O'ahu Chapter
Web: oahu.surfrider.org
Contact: rbergstrom@surfrider.org
Mail: P.O. BOX 283092 Honolulu, HI, 96828

LATE

HB2626: In Support
DATE: Friday, February 23, 2018
TIME: 2 P.M.
PLACE: Conference Room 308

Aloha Chair Luke & Members of the House Committee on Finance,

Of NOTE: In Section 5 there seems to be a typo that instead of 2018, it reads 2118 as the implementation date.

As the O'ahu Chapter Coordinator of the Surfrider Foundation, I am writing in strong support of HB2626, the bill requiring a Cesspool working group to better understand the mechanisms for upgrades of these archaic and environmentally destructive waste disposal systems. Since the passage of Act 120 two years ago, there have only been a handful of cesspool upgrades, and we are working with the Hawaii Dept. of Health (DOH) to improve their public outreach and community involvement.

Non-point source discharge from cesspools in Hawaii is a serious threat to our water quality, and this bill would create a working group to come up with the best ways to do cesspool upgrades, conversions or connections to sewer lines. With about 88,000 across the state, Hawaii has the highest number of cesspools in the country, and many pose a threat to water resources. These substandard wastewater systems leach untreated human waste, harmful pathogens and nutrient loads into nearby waters. Cesspools are a leading source of water pollution, and their effluent can contaminate drinking water sources, streams and oceans with disease-causing pathogens, algae-causing nutrients and other harmful substances.

In monitoring the water quality of North Shore beaches on Kauai, the Surfrider Chapter there has seen improvement after the replacement of cesspools at Kauai County beach parks and along the Hanalei River, where enterococcus counts at the beach at the Pavilion and estuary decreased approximately 56% between 2004 and 2013. Where sewer connections are not available, septic systems and ATU's are a big step forward in protecting public health and the environment. We helped pass the bill to give homeowners tax credits for upgrading their cesspools within 400 feet of the shoreline, waterways or wells because they are the most dangerous. We hope they will make sure the replacements have some form of aerobic digestion.

Unfortunately, we recognize that the $10,000 tax credit does not cover the full cost of new septic systems, which can be as much as $20k-$30k. So we support creating a working group to study the issue and come up with the best solutions for the state. While we understand that the issue is complicating because of the heavy cost of upgrades, the situation is also of pressing need. Our marine resources and

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public health are at stake. Ultimately, the science already exists to prove the problem and the precedent has already been set – no other State allows these archaic infrastructure pieces to be used. The reasons are very simple, the uncontrolled release of untreated human waste into our freshwater and nearshore ocean waters is a detriment to all levels of the health spectrum. One very obvious suggestion is to begin charging monthly fees for all cesspool users to fund a cesspool conversion fund. If members of our community pay sewer fees to dispose of their human waste, it seems natural that the members of community who contribute the most to contaminated release of human waste, would also have to pay fees. We understand that there are issues of equity and historical negligence associated with this funding scheme and thus the reason to support this working group.

Mahalo for your time and effort working on this important issue.

With Aloha,

Rafael Bergstrom
O‘ahu Chapter Coordinator, Surfrider Foundation.

LATE

HB-2626-HD-1
Submitted on: 2/23/2018 2:07:20 PM
Testimony for FIN on 2/23/2018 2:00:00 PM

Submitted By	Organization	Testifier Position	Present at Hearing
Stuart Coleman	Surfrider Foundation	Support	No

Comments: