

DAVID Y. IGE
GOVERNOR OF HAWAII

OFFICE OF THE
GOVERNOR
STATE OF HAWAII
HONOLULU, HAWAII



OFFICE OF THE
DIRECTOR OF HEALTH
STATE OF HAWAII
HONOLULU, HAWAII

VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

03 09 0-7AM 81

10:10 2-7AM 81

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:

March 2, 2018

The Honorable Ronald D. Kouchi,
President and Members of the Senate
Twenty-Ninth State Legislature
State Capitol, Room 409
Honolulu, Hawaii 96813

The Honorable Scott K. Saiki, Speaker
and Members of the House of
Representatives
Twenty-Ninth State Legislature
State Capitol, Room 431
Honolulu, Hawaii 96813

Dear President Kouchi, Speaker Saiki, and Members of the Legislature:

For your information and consideration, I am transmitting a copy of the "The State Environmental Council, The State Office of Environmental Quality Control, Annual Report 2017 pursuant to 341-6 Hawaii Revised Statutes (HRS).

In accordance with Section 93-16, HRS, I am also informing you that the report may be viewed electronically at:

<http://health.hawaii.gov/opppd/department-of-health-reports-to-2018-legislature/>

Sincerely,

VIRGINIA PRESSLER

Director of Health

Enc.

c: Senate
House
Legislative Reference Bureau
SOH Library System (7 copies)
University of Hawaii



**THE STATE ENVIRONMENTAL COUNCIL
THE STATE OFFICE OF ENVIRONMENTAL QUALITY CONTROL**

Annual Report 2017



Table of Contents

1 / LETTERS AND OVERVIEW

Environmental Council Chair's Message.....	p. 4
OEQC Director's Message.....	p. 5
Introduction.....	p. 6

2 / ENVIRONMENTAL COUNCIL AREAS OF FOCUS

Environmental Impact Statement Rules Update.....	p. 7
HI GPI (Genuine Progress Indicator): Update.....	p. 10
Climate Change.....	p. 12
Ocean Thermal Energy Conversion (OTEC).....	p. 14
Sand Resource Extraction.....	p. 18
Feral Cats/Toxoplasmosis.....	p. 22

3 / OEQC DATA

Publications of EAs and EISs in <i>The Environmental Notice</i>	p. 26
---	-------

4 / ABOUT THE ENVIRONMENTAL COUNCIL AND OEQC

Environmental Council Members.....	p. 28
Office of Environmental Quality Control Members.....	p. 33

Chair's Message

JOSEPH SHACAT

“Essentially, a sustainable future for Hawai‘i depends on finding the right balance between social, environmental, and economic considerations. These are not mutually exclusive – the goal is to find synergistic solutions in which the whole is greater than the sum of its parts.”



DURING 2017, THE ENVIRONMENTAL COUNCIL FOCUSED A LOT OF ATTENTION ON UPDATING THE EIS RULES (environmental impact statement rules), a process that is long overdue. There has not been a substantial rules update in 20 years. During this time, the Hawai‘i Supreme Court has weighed in with new interpretations to several provisions of the EIS Rules, and the legislature

has made important changes to the underlying statute, Hawai‘i Revised Statutes (HRS) Chapter 343. One of the primary goals for this update is to align the EIS Rules more closely with these recent legislative changes and judicial interpretations.

During the rulemaking process the public has had numerous opportunities to review our working drafts and provide comments. In some ways, the Environmental Council is held to a higher standard for public disclosure than most agencies with rulemaking authority because the Council is subject to Hawai‘i’s sunshine law. While this has created some logistical challenges during the rulemaking process, it has also provided a unique opportunity to democratize stakeholder engagement, offering a different kind of model for agencies that conduct rulemaking.

The formal public hearings for the draft EIS rules are tentatively scheduled to occur during the first quarter of 2018. The draft that goes out to public hearings will be at least the fourth draft released in the public domain with an opportunity for comments. Ultimately, I sincerely hope that the revised EIS Rules are bereft of unintended consequences, and that the potential implications of every change, large or small, have been thoroughly considered by the Environmental Council.

The importance of this thorough review by the Environmental Council is underscored by the Council’s statutory mandate, which is to determine “an optimum balance between environmental quality and economic development” (HRS Chapter 341).

Although the term “sustainability” was not en vogue when the statute was written in 1970, it conveys the same underlying meaning. Essentially, a sustainable future for Hawai‘i depends on finding the right balance between social, environmental, and economic considerations. These are not mutually exclusive – the goal is to find synergistic solutions in which the whole is greater than the sum of its parts. We should keep this concept at the forefront during the process of revising the EIS Rules.

Update Regarding Commercial Aquarium Fisheries

The Environmental Council’s 2016 Annual Report provided information regarding Hawai‘i’s commercial aquarium fisheries program, including previous correspondence between the Environmental Council, the Office of Environmental Quality Control, and the Department of Land and Natural Resources (DLNR). Since then, the Hawai‘i Supreme Court issued a decision on the *Umberger vs. DLNR* lawsuit. That decision has effectively halted the commercial aquarium fishery in Hawai‘i until an environmental review is conducted by the permittees pursuant to HRS Chapter 343.

Director's Message

SCOTT GLENN

“An especially heartfelt mahalo goes out to my colleagues on the Environmental Council. These 14 members are volunteers who have dedicated a tremendous amount of their time and professional expertise to improve Hawai‘i’s environmental review process.”

2017 PROVED TO BE AN EXCITING YEAR FOR THE OFFICE OF ENVIRONMENTAL QUALITY CONTROL AND THE ENVIRONMENTAL COUNCIL. We were able to realize our potential and simultaneously see how difficult it is to maintain that.

OEQC entered 2017 fully staffed with all five positions filled with permanent, full-time employees, which had not been the case for about 3 years. In addition, Governor Ige appointed a full roster of Environmental Council members, thus resolving the Council's perennial quorum challenges.

With a full OEQC staff and Council we were able to move forward with three major initiatives.

For OEQC, we implemented several business process improvements for intaking and publishing environmental documents. We rolled out a new online library with better organization to quickly find documents. We have several projects underway, including digitizing our environmental review submittal process, expanding our electronic archive, and debuting a new Geographic Information Systems (GIS) map of projects and programs that integrates with the state's GIS data.

Secondly, we have supported Governor Ige and coordinated with state and county agencies on implementing the Paris Agreement commitment that Hawai‘i made in June 2017. At that time, Governor Ige also joined Hawai‘i with the U.S. Climate Alliance, a bipartisan group of U.S. states and territories committed to climate action by working together and with international partners.

Thirdly, a fully staffed OEQC and appointed Council meant that we were able to move forward with updating Hawai‘i Administrative Rules (HAR) Chapter 11-200, Environmental Impact Statements. We brought on University of Hawai‘i William S. Richardson School of Law to assist us with drafting and organizational support.

An especially heartfelt mahalo goes out to my colleagues on the Environmental Council. These 14 members are volunteers who have dedicated a tremendous amount of their time and professional expertise to improve Hawai‘i's environmental review process. They met as often as twice a month for several months. This is especially the case for neighbor island members who often have to leave their homes before dawn to fly to O‘ahu for a day full of committee meetings and then the full Council meeting.



In between these meetings, Council members are meeting with their communities, both geographic and professional, to gain feedback and perspective on how the rulemaking is going and how to improve our proposed changes.

As we closed out 2017, we said aloha to several OEQC folks, including Coco Needham, our secretary, and Zack Stoddard, now with the City and County of Honolulu Department of Planning and Permitting.

Looking forward to 2018, the OEQC will look to staff back up, complete our digitization projects, refine our business processes, and support the Council in its rulemaking.

Mahalo to everyone for your kōkua moving forward.

Introduction

BY STATUTE, the Environmental Council (“Council”) is “tasked” with producing an annual report on the State's progress toward achieving Hawai'i's environmental goals. While the Council has no line-item budget or staff of its own, it does its best working with the Office of Environmental Quality Control to produce its report.

“The council shall monitor the progress of state, county, and federal agencies in achieving the State's environmental goals and policies and ... make an annual report with recommendations for improvement to the governor, the legislature, and the public no later than January 31 of each year.”
(HRS Chapter 341-6)

The state environmental goals and policies are a reference to [Hawai'i Revised Statutes Chapter 344](#). Chapter 344 establishes broad policy and guidelines relating to environmental quality. These guidelines, in turn, are left to agencies and the Council to figure out how best to measure progress in achieving them.

Over the years, the Council has monitored this in different ways. One way was using an “Indicators Report Card” format on different aspects of the environment such as an “A” for air quality. These indicators were based on data drawn from state, county, and federal agencies. The Council supplemented these indicators with thematic environmental information, such as the 2008 report on food security and food self-sufficiency (a topic still relevant 10 years later).

More recently, the Council moved to a more holistic measurement using the Genuine Progress Indicator (GPI). The Council has explored GPI for the past several years. This year's report provides updates to selected indicators while researchers continue to refine the method and data.

In addition to the GPI, this year's report summarizes the Council's ongoing rule-making efforts and topics the Council has considered over the past year.

These topics and authors are:

- » **Climate Change**, by Chair Joseph Shacat,
- » **Ocean Thermal Energy Conversion**, by Roy Abe,
- » **Sand Mining on Maui**, by Robert Parsons, and
- » **Feral Cats**, by Maka'ala Ka'aumoana

Each of these essays are written by the individual Council member in the voice of the Council member. The Council chose these authors and these topics to both convey the types of topics brought before the Council and for the general public to get a better sense of the members. Endnotes to the essay are found at the end of the report.

The essays do not reflect the formal positions of the Council, rather they are the perspectives of individual Council members who are engaged with the topic. In 2018, the Council will continue to engage in constructive dialogue with all stakeholders to identify and promote reasonable approaches to resolving these challenges.

At the end of the report is a presentation of what the OEQC published in *The Environmental Notice* in 2017. By statute and rule, the OEQC is required to publish environmental assessments (EAs) and environmental impact statements (EISs) on the 8th and 23rd of every month.

Finally, the report concludes with biographies of the individuals of the Council and the OEQC.

Environmental Impact Statement Rules Update

by **SCOTT GLENN**, *OEQC Director*
and **CHRISTINA LIZZI**

FORTY-THREE YEARS AGO, the legislature passed an act establishing an environmental review process to enable informed agency decision-making through the preparation of environmental impact statements (EISs), environmental assessments (EAs), and when appropriate, exemption notices. The legislature found:

“... [t]hat the quality of humanity's environment is critical to humanity's well being, that humanity's activities have broad and profound effects upon the interrelations of all components of the environment, and that an environmental review process will integrate the review of environmental concerns with existing planning processes of the State and Counties and alert decision makers to significant environmental effects which may result from the implementation of certain actions. The legislature further finds that the process of reviewing environmental effects is desirable because environmental consciousness is enhanced, cooperation and coordination are encouraged, and public participation during the review process benefits all parties involved and society as a whole.” (Section 343-1, HRS, Purpose)

The need and purpose rings as true today as it did in 1974. EISs, EAs, and Exemptions are the primary tool for considering the environmental impact of agency actions, as well as some private actions.

The process also enables public participation: it requires notice of the action and public comment periods and responses to comments for both EISs and EAs. Oftentimes, the environmental review process is the main opportunity for the public to weigh in on proposed developments or agency actions. The information gathered helps agencies make informed decisions about the impacts of a proposed action on the environment, defined broadly to include all the physical, economic, cultural, and social conditions that exist within the area affected by a proposed action,

including land, human and animal communities, air, water, minerals, flora, fauna, ambient noise, and objects of historic, cultural, or aesthetic significance.

One of the Environmental Council's foremost responsibilities is to develop and update implementing regulations (referred to as the “Rules”) for Chapter 343, Hawai'i Revised Statutes (HRS). In 2017, the Council focused on drafting updated Rules in a process calling on full public participation and testing out new online platforms for public comment.



A Brief History of the EIS Statute and Rules

In 1974, Governor John Burns signed Act 246 into law, establishing the Environmental Impact Statement process, modeled after the National Environmental Policy Act. In 1983, the State Environmental Council (the “Council”) was established and tasked with rule making authority for Chapter 343, HRS. In 1985, the Council promulgated Chapter 200, Title 11 of the Hawai'i Administrative Rules, implementing Chapter 343, HRS.

The Rules have only been amended twice since 1985. In 1996, the Council amended the Rules to incorporate a 30-day public comment for actions that an approving agency anticipates will result in a Finding of No Significant Impact (then referred to as a “Negative Declaration”). In 2007, the Rules were amended to add an exemption class for the acquisition of land for affordable housing, but the amendment was not compiled with the rest of the Rules.

Environmental Impact Statement Rules Update, **con't**

The Current Updates: Six Years in Progress

In 2011, the public formally petitioned the Council to update the Rules. The Council initiated consultation with state and county agencies for recommendations on issues to address and language revisions and, in 2012, released a preliminary draft of revisions (“Version 1”) incorporating proposed revisions from previous Council efforts and issues raised by agencies and the public. The Council also distributed an Excel file called a “comment matrix” to receive feedback on Version 1. Agencies and the public (including applicants, consultants, and nonprofit organizations) submitted comments via the comment matrix. The Council organized the feedback into a master comment matrix and tasked the Rules Committee with addressing the feedback and making revisions to the language. The Rules Committee met regularly over the course of 2012–2014 to revise Version 1. However, due to various administrative challenges, including maintaining quorum, the Council was not able to complete its work.

In February 2016, following Governor Ige’s appointment of seven members to the Council, the Council addressed its quorum challenges and resumed moving forward on revisions to the Rules. As part of this effort, the Council wanted to recognize the extensive outreach and drafting that the 2012 Council conducted. To do this, the Council established a Permitted Interaction Group (the “PIG”) to draft revisions to the Rules for the Rules Committee of the Council to review, based primarily off of the feedback received in 2012.

The PIG’s revisions were presented to the Council for discussion in the summer of 2017, and referred to as Version 0.1. The Council requested both agency comment and public input. It also established a contract with the William S. Richardson School of Law for assistance with drafting. In September 2017, the Council released Version 0.2, incorporating Council discussions to date, and public and agency input. The Council again requested input from the public and agencies.

In October 2017, the Council released Version 0.3, which refined several sections based on public feedback and re-organized the chapter.

The Council released Version 0.4 on February 20, 2018. This version will likely be voted on by the Council to go to a formal public comment period, including public hearings in each county (and each island if budget allows). After the public comment period, the Council may make further adjustments to the proposed Rules based on the comments. The Council will then vote to send a final Rules package to the Governor for approval and to replace the 1996 Rules.

Public Outreach

The Council actively sought out public input in ways unprecedented in State rulemaking processes. Public comment was requested on multiple discussion drafts and collected in both traditional and novel ways. The Council used the Civiccomment platform (<http://oeqc.civiccomment.org/>), enabling the public to view the proposed rules and comment directly on them.

The Council also created a page on its website dedicated to the Rules update (<http://health.hawaii.gov/oeqc/rules-update/>), including a timeline, instructions for commenting, and a sign-up box to receive updates on the Rules process. Public comments were also accepted at all Council meetings. In addition, Council members spoke on local radio shows, gave presentations to community, environmental business and agency groups, and spread the word through social media.

Major Themes in the Revisions

The most striking proposed change to the Rules is a reorganization of the current Chapter 200, Title 11, Hawai'i Administrative Rules to more closely reflect the steps that agencies and private citizens follow when preparing EAs or EISs.

Other changes are legislatively driven. In 2012, the legislature passed Act 50, requiring a cultural assessment as part of an EA or EIS. The proposed rules insert "cultural" into in the definition of environment and in several other places within the Rules as mandated by the Act. The proposed Rules also introduce a public scoping meeting requirement prior to preparation of a draft EIS to help balance the new legislatively created direct-to-EIS pathway, that allows applicants and agencies to prepare an EIS without first preparing an EA.

The proposed Rules also offer definitions of "project" and "program," encouraging the preparation of programmatic EAs and EISs when appropriate by more clearly distinguishing what level of information needs to be included in an EA or EIS prepared for a project from what needs to be included in an EA or EIS for a program.

Further, the proposed Rules account for the electronic availability of *The Environmental Notice*, EAs, EISs, and other information or documents related to environmental review and lessen some requirements for printing and distributing hard copies of documents. The proposed Rules also contemplate changes to exemption categories and agency preparation of exemption lists, and new ways to handling and responding to public comments.

The Council's focus in drafting the proposed Rule amendments is modernizing the EIS process to make it more efficient, while balancing and encouraging opportunities for public participation and a thorough vetting of the environmental impacts associated with agency actions and private actions subject to Chapter 343, HRS. The Council will continue to work on the Rules update in the first half of 2018. To receive updates on the process and sign-up for alerts at:

<http://health.hawaii.gov/oeqc/rules-update>

For More Visit the Rules Update Website:

<http://health.hawaii.gov/oeqc/rules-update/>

Hawai'i GPI Update (Genuine Progress Indicator)

by **DR. REGINA OSTERGAARD-KLEM** (HPU), **DR. KIRSTEN OLESON** (UH Mānoa),
and **MARIAH DAILEY** (HPU)

OVER THE LAST YEAR, we continued to support the Environmental Council by updating the Genuine Progress Indicator (GPI) with the most current information available, while following the same framework used in the 2012 report for consistency. In order to understand how the GPI can be helpful, first look at the global reliance on gross domestic product (GDP) as the primary indicator for determining “progress” as equated with economic growth. Since its development in 1934, GDP’s designer, Simon Kuznets, warned against the use of this indicator for anything but measuring national income. Nevertheless, however unsuitable, GDP has morphed into a widely accepted measure of comparative well-being, yet its financial nature tells little of the well-being of a nation. Most problematic is the lack of separation between cost and benefit, as GDP accounts only for the production and consumption of goods and services, but not the resulting impacts, both negative and positive. Most eloquently put by Robert Kennedy, “GDP does not allow for the health of our children, the quality of their education, or the joy of their play”. In other words, a macroeconomic indicator merely measures quantitative growth, largely ignoring the qualitative nature of what is important to us.

GPI aims not to rid the world of GDP, but use it as a basis to which essential adjustments can be made. GDP is a useful measure within the correct context, but otherwise requires adjustment to paint a more accurate and holistic picture of progress. The standard GPI framework relies heavily on existing, publicly available information so for the most part does not require an upheaval of government procedures. In the 2014 Council Annual Report, we proposed a variation of GPI, called GPI Island Style. This variation of GPI omits, expands, and amends existing indicators in the standardized GPI framework to better show Hawai'i's conditions and inform local policy.

While GPI strives to use the best available data, it has the potential to invigorate a participatory process across local institutions and communities to improve local data collection and promote local valuation studies.

The GPI formula measures 26 indicators (see wheel to the right) that divide between social, economic and environment, and can be further simplified to the following equation:

$$\mathbf{GPI = PCE (adj) + G + W - D - S - E - N}$$

PCE = personal consumption adjusted for income inequality

G = growth in capital

W = non-market services generating welfare (unpaid labor, housework, volunteering)

D = private defensive expenditures (protection against crime, pollution)

S = change in social capital (cost of commuting)

E = environmental degradation (pollution)

N = depletion of natural capital (loss of forests)

GPI is a tool that can be used to share information across the islands to kick start interest in our collective goals, and provide a convenient measure for all residents to take pride in. What better way to improve equity, develop a resilient economy, or foster an environmental ethic than engaging the support of community members themselves?

The ability to determine well-being alongside GDP would largely enable residents, organizations, and leaders to assess the true quality of life in Hawai'i. It provides a concise analysis of what is important to us as Hawai'i residents, where we excel, and where we need work harder.



TABLE OF SELECTED GENUINE PROGRESS INDICATORS	CHANGE (2012-2016)
Personal Consumption Expenditures (PCE)	+5%
Income inequality	No significant change
Adjusted PCE	+3%
Cost of consumer durables	+7%
Cost of underemployment	-17%
Cost of water pollution	-5%
Cost of farmland change	No significant change
Cost of forest change	No significant change
Cost of crime	+22%
Cost of personal pollution abatement (e.g., wastewater, solid waste)	+2%
Value of volunteer work	-27%
Cost of lost leisure time	+16%
Value of higher education	+2%

An overall figure for GPI and GPI per capita as of the year 2016 is still under review, however the table above right highlights some of the indicators for which preliminary results are available.

Within the economic category of indicators, the cost of consumer durables rose during the time period from 2012 to 2016. In the environmental category of indicators, the cost of water pollution decreased as the number of impaired streams in the state also decreased. Of the social indicators, the cost of lost leisure time increased as the average number of hours per worker per year increased combined with a higher average hourly pay rate. The value of volunteer work changed significantly, reflecting a drop in volunteer hours per resident per year from 39 hours in 2012 to 25 hours in 2016.

Reflecting on the work to develop a baseline GPI thus far has yielded many lessons that inform future GPI efforts. Next steps for a localized Hawai'i GPI are to:

- Validate existing data sources and close data gaps;
- Seek out more complete, localized data and data sources for both existing indicators as well as new proposed indicators unique to Hawai'i;
- Advocate for a more systematic and regular data collection process; and
- Incorporate new findings from the GPI 2.0 literature and what we learn from practitioners in other states.

GPI is a useful tool to highlight trends in important economic, social, and environmental indicators. We continue to look for ways to better reflect true progress for the citizens of Hawai'i.

Climate Change

by JOSEPH SHACAT



WE LIVE IN AN ERA FRAUGHT WITH POLITICAL TENSION REGARDING CLIMATE CHANGE. On the one hand, the President and his administration seem to be dismantling every bit of progress that has been made during the past decade from a national policy perspective regarding climate change and the threats associated with global warming. On

the other hand, states and municipalities have pushed back with their own initiatives to reduce greenhouse gas emissions, prepare for sea level rise, and plan for resiliency. The State of Hawai'i was the first state in the country to align itself with the Paris Climate Accord by statute, and the four counties have joined hands with cities around the world to address climate change at the local level.

One important question is how rising sea level is going to impact communities throughout Hawai'i, across the country, and around the world. Some of our Pacific Island neighbors to the south are already experiencing significant impacts of sea level rise. At least five small islands, and portions of others, have been completely swallowed by the sea, displacing the residents of at least two villages in the Solomon Islands.¹ The same is happening to small islands located in the Chesapeake Bay.²

With the recent publication of the Hawai'i Sea Level Rise Vulnerability and Adaptation Report, we now have the first state-wide assessment of our vulnerability to sea level rise. This report, which is available at <http://climateadaptation.hawaii.gov/>, provides an important look at the economic, cultural, social, and environmental impacts that are expected in the coming years.

The numbers associated with a sea level rise of 3.2 feet are staggering³:

25,800 acres of land will become unusable, **34%** of which is designated for urban use.

6,500 structures located near the shoreline will be flooded.

20,000 residents will be displaced from their homes.

\$19 billion in property damages and losses, not including infrastructure, which could be an order of magnitude greater.

38 miles of major roads will be flooded.

550 cultural sites will be flooded.

2,000 on-site sewage disposal systems will be flooded.

The latest estimates predict that we will see 3.2 feet of sea level rise by mid-century. State and county agencies need to start planning for how to respond to this challenge. While some areas can be protected through innovations in design and engineering, other areas may have to be abandoned in order to preserve our beaches, or simply because it's too expensive to save the structures. These are, and will always be, difficult and costly decisions to make.

The latest estimates predict that we will see 3.2 feet of sea level rise by mid-century. State and county agencies need to start planning for how to respond to this challenge.

We also know that global warming will increase the intensity of hurricanes, a phenomenon that was first predicted thirty years ago.⁴ This prediction has borne out over time, with more recent research demonstrating that the destructive power of tropical cyclones has increased substantially over the past several decades.⁵ Indeed, 2017 has proven to be a year to remember for North Atlantic hurricanes – Hurricane Harvey inundated Texas with the most rainfall from a single storm in the continental United States⁶, Hurricane Irma was the longest-lived category 5 storm on record⁷, while Hurricane Maria battered Puerto Rico with powerful winds and record-breaking rains. It will cost hundreds of billions of dollars to rebuild Texas, Florida, and Puerto Rico.

More importantly, the slow pace of rebuilding in Puerto Rico demonstrates the risk that we face in Hawai'i – three months after Hurricane Maria, Puerto Rican officials don't even know how many customers have power, and some parts are expected to go without electricity for eight months.⁸ This year, tropical cyclone activity in the North Pacific was somewhat quiet, and once again Hawai'i has been spared. But it's really only a matter of time before another catastrophic hurricane hits Hawai'i.

We cannot just stand on the sidelines and hope that continued innovations in clean energy technologies, combined with sound and prudent decision making, will yield a sustainable future for all – we need to act.

Unfortunately, climate change will impact more than just the coastal communities. Future shifts in the habitat ranges of endangered plants and animals might conflict with the boundaries for habitat reserves located within public parks and on private lands, putting our precious endangered species at even greater risk. We can expect to see significant changes in rainfall patterns, too, and a continued trend of decreasing trade wind days.⁹

Is there hope for the future?

One of the more promising, but misunderstood and under-appreciated opportunities, is Ocean Thermal Energy Conversion (OTEC), which is discussed in the next essay of this report. Recent advances in OTEC technology offer the ability to produce clean energy and fresh water at utility-level scales while also reversing global warming. OTEC deserves a fresh look from policy makers and clean energy investors alike.

Hawai'i also needs to continue setting an example as a leader in energy policy. Some of our recent accomplishments as a state include the following:

- The first state to sign on to the Paris Climate Accord.
- The first state to have a 100% renewable energy goal (by 2045).
- Leading the nation in residential solar generation per capita.¹⁰
- Fourth in the nation in sales of electric vehicles as a portion of new car sales.
- Second in the nation in electric vehicle registrations per capita.¹¹
- All four county mayors have pledged 100% renewable ground transportation by 2045, the first state to set such a goal.¹²

Although these accomplishments are notable, now is not the time to rest on our laurels. There is a great deal of work to be done to plan for, mitigate, and ultimately prevent the significant impacts that are predicted to occur as a result of climate change. We cannot just stand on the sidelines and hope that continued innovations in clean energy technologies, combined with sound and prudent decision making, will yield a sustainable future for all – we need to act.

OTEC as a Key Renewable Energy Alternative for Hawai'i

by ROY ABE



HAWAI'I HAS BEEN AT THE FOREFRONT OF PROMOTING THE GLOBAL SHIFT FROM RELIANCE OF FOSSIL FUELS TO RENEWABLE ENERGY SOURCES. Ocean Thermal Energy Conversion (OTEC) is a significant renewable energy technology that has received limited attention in recent years despite substantial research conducted locally since the

1970s. This technology, particularly due to recent advances, could potentially completely eliminate the dependence of fossil fuels in Hawai'i and many other areas of the world within the next several decades. OTEC is unique in its potential to actually "reverse" the effects of global warming.

Dr. Hans Krock, a world renowned expert on OTEC, enlightened the Environmental Council members on this promising technology at the October 2017 meeting. The following is a summary of Dr. Krock's presentation and other information on this technology.

What is OTEC?

The concept of OTEC was originally introduced in 1881 by a French scientist, Arsene D'Arsonval. By taking a liquid with a low boiling point such as liquid ammonia and using the warm tropical sea surface water (greater than 24 deg C) to boil the ammonia, the change from a liquid to gas produces a significant volumetric increase of 600 to 1 or more. This large increase in volume in a confined chamber creates pressurized flow can turn a turbine to generate electric power. By using deep cold water from the ocean at about a 1,000 meter depth at 4 deg C to cool the vaporized ammonia, the ammonia gas is then returned back to its original liquid form. The cycle is continuously repeated to generate power.

OTEC is most cost-effective in tropical seas where water depths exceed 1,000 meters and a 20 deg C or more differential temperature exists between the warm surface sea water and the cold deep sea water. OTEC is able to operate 24 hours a day, year after year, with relatively little maintenance.

Why do we need OTEC?

In the face of growing global energy demand and environmental concerns, the limitations in our current energy practices and policies are coming into sharp focus. Concerns include:

- Over dependence on finite fossil fuel and nuclear resources.
- Detrimental environmental effects such as global warming, rising sea levels, changes in weather patterns, oil spills, air pollution, and hazards from nuclear waste materials.
- Detrimental socio-economic effects, including energy import/export trade imbalances and war.

The ocean stores a vast amount of heat and energy. The heat stored in the tropical ocean surface layer is derived from the sun and constitutes the largest energy resource on the surface of the earth. This is also the primary energy source that drives the world's weather. In the tropical zone between the Tropic of Cancer and Tropic of Capricorn, sea water warmed by the sun's rays absorbs on a daily basis approximately 10,000 times the energy consumed daily by all mankind.

OTEC is the only source of energy that is virtually limitless and sustainable, and is large enough to replace fossil fuels. Large scale development and deployment of OTEC technology can provide an environmentally friendly, sustainable solution to our energy needs.

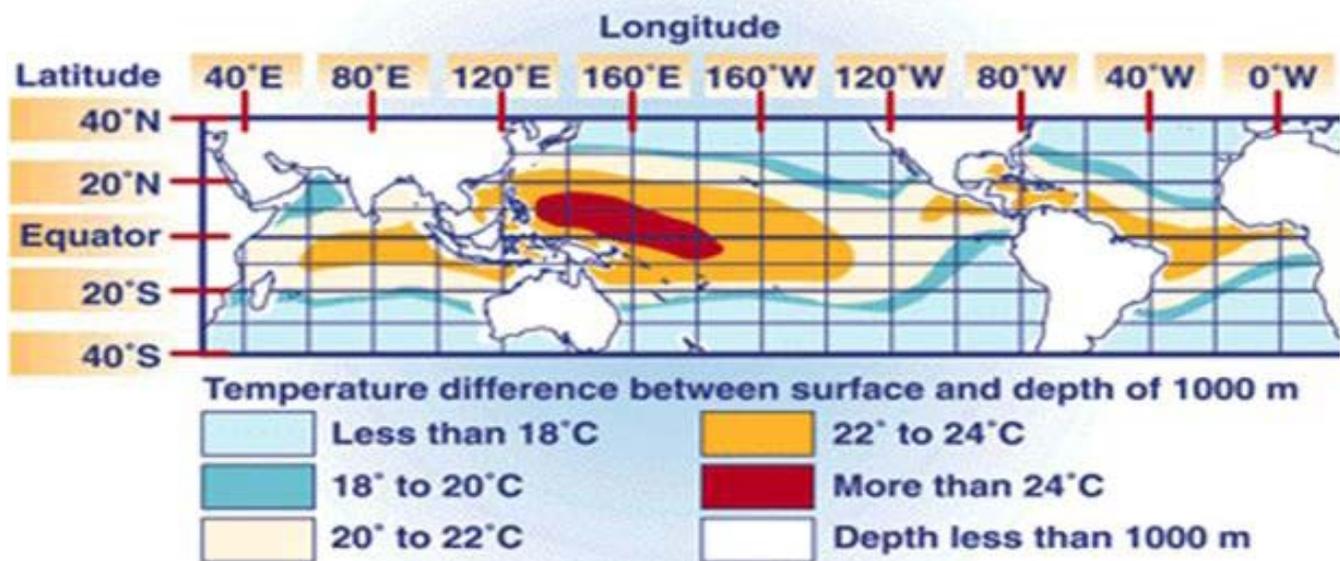
What are the advantages of OTEC?

OTEC has the following significant advantages:

- OTEC energy is available 24 hours a day, 365 days a year. Wind and solar energy production, without costly storage systems, can vary significantly.
- OTEC provides clean, sustainable, and 100% renewable energy.
- The tropical ocean heat reservoir is the largest energy resource on the surface of the earth, and is more than enough to supply all of humanity's energy needs in perpetuity.
- Large scale use of OTEC systems can reduce and even reverse global warming by reducing the ocean temperatures.

With the excess electricity produced by OTEC during off-peak periods, hydrogen and oxygen can be manufactured by separating the hydrogen from the oxygen in water electrolysis. The resulting H₂ and O₂ gases can then be liquefied and transported in cryogenic tankers to various destinations. Fresh water can also be produced by using the electric power generated to operate reverse osmosis desalination equipment.

In the less efficient "open cycle" OTEC process where seawater is substituted for liquid ammonia, seawater is vaporized by inducing a vacuum in an enclosed chamber and causing it to boil at a lower temperature when activated by the warm surface seawater. Similar to the "closed cycle" system using ammonia, the vaporized water causes a large change in volume that creates a draft to power a turbine that generates electrical power. A benefit of the open cycle system is that the subsequent condensation of the water vapor by the cooling effect of deep ocean cold water produces distilled fresh drinking water.



OTEC as a Key Renewable Energy Alternative for Hawai'i, con't

by ROY ABE

OTEC reduces CO₂ emissions by replacing fossil fuels, but there are additional benefits with respect to reversal of detrimental consequences of anthropogenic CO₂. Temperature increases in the surface layer of the ocean due to global warming have caused greater density differences between surface and deep ocean waters. The resulting decrease in mixing of nutrient-rich deep water with the surface layer photic zone has caused a significant decrease in primary productivity (photosynthesis) in tropical waters. The combination of reduced photosynthesis and more CO₂ being absorbed by the ocean surface layer due to the higher atmospheric concentration of CO₂ has caused lower pH levels in the tropical ocean surface layer. The lower pH has adverse impacts on coral reefs.

OTEC systems will extract heat from the ocean surface layer and thereby reduce water temperature of this layer and decrease the density difference with deep ocean water. This will in turn promote mixing and nutrient upwelling. This will then result in increased photosynthesis and uptake of CO₂, higher pH levels that benefit reefs, and greater primary productivity that helps fisheries.

What are some of the recent significant advances in OTEC technology?

OTEC was extensively researched in Hawai'i starting in the 1970's, first with the floating "Mini OTEC" off the Kona coast of Hawai'i island in 1979, and later with a land-based OTEC system in Kona by the Natural Energy Laboratory of Hawai'i Authority (NELHA). (See next page for more.)

Is OTEC currently economically feasible and should Hawai'i pursue this technology?

Due to the advances in OTEC technology, OTEC is currently economically feasible despite relatively depressed oil prices. A 750 megawatt (MW) OTEC floating platform system, which could be comprised of six linked 125 MW modular systems with independent and redundant cold water supply systems, could meet the average electrical power needs of O'ahu. Such a system is estimated to have a capital cost of between \$6 to \$7 billion in current dollars. Including operating costs and based on amortizing the initial capital cost over 20-years and a discount (interest) rate of 8 percent, the OTEC system would be expected to produce power at approximately \$0.13 per kilowatt hour (kWhr). Peak electrical loads could be met with conventional or other renewable energy sources, or ideally with additional OTEC capacity which can generate hydrogen fuel during non-peak periods.

Similar to hydroelectric power, OTEC has a very high up front capital cost, but low operating costs. A public-private partnership should be considered to implement OTEC. Hawai'i could potentially partner with one or more of the many environmentally conscious corporations and or multi-billionaires to fund the first full scale modular OTEC system. The first state, country or other entity to successfully deploy an operational full scale OTEC facility would likely be positioned to benefit financially from the many follow-on OTEC projects throughout the world.



Notable improvements to OTEC by Dr. Krock and Dr. Yee include:

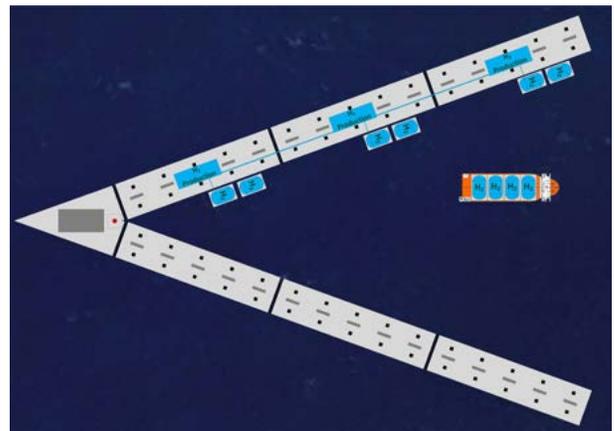
- **Large modular floating OTEC platform concept using high strength light weight concrete and honeycomb structural design for the platform.** A floating platform similar to that proposed for the OTEC platform has successfully been used for more than 30 years in harsh marine conditions by the oil drilling industry. Land-based OTEC systems require a long, large-diameter cold water pipeline. The pipeline is very costly, difficult to construct, and subject to damage from severe wave conditions. The floating OTEC platform uses a shorter vertical pipe suspended from the platform and only requires a power cable between the platform and the shoreline. Well-proven designs and technology already exist for submarine power cables.

- **Use of submersible pumps to convey the large volume of deep ocean cold water.** Submersible pumps located at the inlet end of the submerged cold water pipe can be used to pump the cold water up to the floating platform. There are major advantages of utilizing submersible pumps in lieu of a “suction” configuration with pumps located on the floating platform. Submersible pumps would allow the use of a more economical smaller diameter flexible cold water pipe. Pumps can readily “push” water through a long flexible pipeline at higher velocities and flow rates compared to a suction configuration that would need to “pull” water through a larger rigid pipe. Technology for deep water submersible pumps is well established due to use of similar pumps in the petroleum industry.

- **Use of a flexible cold water pipe in lieu of a rigid pipe.** Design of a large rigid cold water pipe extending to depths of 1,000 feet or more is challenging due to the stresses imposed by currents and waves. The use of a flexible pipe constructed of Kevlar material is proposed to alleviate the structural concerns. The use of submersible pumps, which pushes rather than pulls water through the pipe, permits the use of a flexible cold water pipe. A flexible pipe can be easily deployed as it would simply be unwound. A backup cold water pipe could be readily stored and deployed to replace an existing pipe if needed.

- **Use of Kalina cycle technology.** The efficiency of OTEC can be increased by use of the Kalina cycle, which is a closed-cycle system that uses an ammonia and water mixture as the working fluid. It is a proven technology that has been used in for heat engines in low temperature differential applications such waste heat from power plants and steel mills, and heat from geothermal sources. The Kalina cycle uses commercially available corrosion resistant equipment.

Dr. Hans Krock of Krock Design Associates, LLC, is an Emeritus Professor of Ocean and Resources Engineering at the University of Hawai'i. He is globally recognized as the architect of the resurgence of OTEC technology. Dr. Krock teamed up with the late Dr. Alfred A. Yee of Yee Precast Design Group, Ltd., who was an internationally recognized structural engineer specializing in precast prestressed concrete structures, including marine offshore barges and platforms. Energy Harvesting Systems, LLC (EHS) was formed to combine the skills and knowledge of Dr. Krock and Dr. Yee to design a state-of-the art floating modular OTEC system.



Sands of Time: Maui's Focus on Natural Resource Extraction

by **ROB PARSONS**



AT THE CLOSE OF 2017, deliberation by the Maui County Council regarding excavation of its inland sand dune resources spanned more than a dozen meetings, provoked heated discussion and a lawsuit, and was one meeting short of passing a bill for a 6-month moratorium on the practice.

At its final meeting on December 15th, Maui's

Council members gave an initial nod to a time-out for Maui Lani 100 Partners, LLC and HC&D (formerly Ameron), to allow for updating an 11-year old study which at that time predicted only 5 – 7 years of continued sand-mining before the resource would be exhausted.

The discussion, which surfaced after a KHON investigative report linking Maui exported sand to concrete used to construct the HART rail project on O'ahu, proved to be extremely complex. Native Hawaiians demanded an end to desecration of burial grounds of their kūpuna. Maui Lani property owners and construction industry reps debated language in a grading permit that had been granted to remove up to 214,000 square yards of sand from a 9-acre site. Coastal consultants pleaded the case for clean sand to be utilized for sandbags and beach nourishment projects. Golf courses stated the ongoing need to use sand for tee-box repairs and fairway aeration (bunker sand is usually finer grained, imported silica sand). Citizens clamored to establish which County or State agencies had proper jurisdiction to regulate these activities. And sustainability advocates said Maui resources should be used locally, not shipped to O'ahu to meet construction needs.

After reviewing the information, Mayor Alan Arakawa sent a transmittal to the County Council in May, (as he had done 11 years ago when the Maui Inland Sand Quantification Study was completed), asking them to consider a moratorium on the practice while the numerous issues could be addressed. Planning Director William Spence concluded that while the companies had obtained a valid grading permit through the Department of Public Works, the excavation of vast quantities of materials equated to "resource extraction," which would require a County Special Use Permit (SUP). Spence issued a stop work order until an SUP could be submitted. Maui Lani's legal team responded with a letter questioning the language in the Maui County Code Zoning chapter. However, HC&D did halt work on the site.

After reviewing the information, Mayor Alan Arakawa sent a transmittal to the County Council in May, (as he had done 11 years ago when the Maui Inland Sand Quantification Study was completed), asking them to consider a moratorium on the practice while the numerous issues could be addressed.

Two other significant actions were taken by HC&D, who, along with Hawaiian Cement, are the main purveyors and users of the inland sand resource: One, they pledged to keep Maui sand for use in Maui County; and, two, they announced they would be utilizing imported sand from British Columbia for construction purposes on O'ahu.



From 2003 – 2006, Maui County began questioning the impacts of widespread sand excavation and exportation, and commissioned the study to quantify the existing resource. Make no mistake, Maui has no shortage of sand, as the Onehe'e Dune system stretches for miles from the Waihe'e Coastal Reserve, with 200 foot tall dunes, all the way to Waikapu, just north of Mā'alaea Harbor. However, the amount of *available* sand, not impounded by urban infrastructure, roadways, schools, houses, buildings and a golf course (The Dunes at Maui Lani), turned out to be surprisingly limited. At the same time, shipping of barges of sand to O'ahu peaked at 96 for the year 2006, shortly before the recession caused those numbers to drop. A decade later, Kahului Harbor statistics showed the number of visits by the sand/aggregate barge the Quinault were again on the rise.

One of the main complaints of those filing a lawsuit over sand mining was that the County Department of Public Works and the State Department of Land and Natural Resources, State Historic Preservation Division (SHPD) had failed to adequately enforce a condition requiring archaeological monitoring during all ground moving activities at the Maui Lani site. Plaintiffs attest that the site corresponds with historical accounts of a large Central Maui battle of Kakanilua, the place name for the sand hills below Wailuku. SHPD and an archaeological consultant stated at a May, 2017 meeting of the Maui-Lāna'i Islands Burial Council that they did not know the number of burials discovered in the Central Maui dunes, but that it, "could be more than 500 but probably less than 1,000."

Nationally and worldwide, sand and gravel are the most extracted resource of all, surpassing fossil fuels, lumber, and metal ores. Hawai'i is far from the first place to encounter carrying capacity limits in using its local sand and gravel resources for construction purposes. Singapore's rampant development has been aided by sand imports from Indonesia, Vietnam, and Cambodia. Within the past two years, each of those countries has halted their exports.

Major international agreements such as the [2030 Agenda for Sustainable Development](#) and the [Convention on Biological Diversity](#) promote responsible allocation of natural resources, but there are no international conventions to regulate sand extraction, use, and trade.

Major international agreements such as the 2030 Agenda for Sustainable Development and the Convention on Biological Diversity promote responsible allocation of natural resources, but there are no international conventions to regulate sand extraction, use, and trade.

Maui's rapid pace of inland sand excavation resulted in a five-fold increase in price over the past decade, from \$20/ ton to a current price of \$100/ ton. The issue of whether sand falls under the classification as a "mineral" resource in Hawai'i is clouded by definition of the word. It appears the question of whether sand is a "valuable mineral" in the way gold, metal ores, and fossil fuels are may be governed by whether the resource is readily available or is close to a potential market.

Sands of Time, con't

Hawai'i has considered the impacts of its resource extraction in the past. The first extractive industry for export purposes was the sandalwood trade in the early 19th century. While chiefs, including Liholiho profited from the venture, many Hawaiian workers died from introduced diseases and working in rainforest conditions, and the resource itself was depleted within a few short decades. Whaling and sealing resulted in economic booms for some, but again quickly depleted the once-abundant resource. Hawaiian monk seals to this day are listed as endangered, and number only around 1,100 individuals.

In 1954, the Hawaiian Commercial and Sugar Company's (HC&S) desire to increase the output of the Pā'ia Lime Kiln, coupled with the company's concerns for both beach reserves and their values, prompted a request for a study by eminent geologist Dr. Doak Cox of the Hawai'ian Sugar Planters Association (and later first director of the University of Hawai'i Environmental Center).

The objectives of the study were to estimate what quantities of sand could be withdrawn from the beaches in question without adversely affecting them or, failing that, to recommend studies that might lead to the development of such an estimate. In the resulting study, "The Spreckelsville Beach Problem," Dr. Cox evaluated decades of removal of sand and coral for road-building, plantation uses, and concrete and airstrips during World War II.

The report concluded that "a considerable amount" of additional research appeared justified. Pending completion of such studies, Dr. Cox also recommended that HC&S not expand lime production, make modifications to existing practice, cease taking sand from the beach for uses, such as road surfacing, that could be economically supplied by other sources. Consistent with Dr. Cox's recommendations, HC&S continued to run its Paia Lime Kiln for approximately 25 more years.

Today, state law prohibits anyone from removing beach sand or coral rubble, either for commercial or personal use. Fines of up to \$100,000 may be imposed.

The recent scrutiny on the complexities of mining inland Maui dune sand will surely bring about new policies, practices, and possible legislation. It may also afford opportunities to evaluate what other local resources may need to be considered and regulated, lest we squander their value and find ourselves in a similar conundrum.

Hawai'i's construction industry is greatly dependent upon imported materials, notably lumber, drywall, glass, shingles, and steel. There may be great value in the future in offsetting imports with things we can produce locally, including a native hardwood industry, bamboo, and even plastic lumber from local recycling. Similarly, agriculture may benefit from broad initiatives for regional composting with nutrient-rich inputs, such as from robust collection programs for food waste. This could replace imported chemical fertilizers, while keeping methane-producing organic materials out of our landfills.

The sand-in-the-hourglass analogy is entirely appropriate for this discussion: we needn't wait until it is almost too late before we realize that our status quo is unsustainable. Let 2018 be the year where our communities and decision makers join to make concrete efforts to stride towards island sustainability.

Author's Note — After 8 months of review, in January 2018 the Maui County Council passed a 6-month moratorium on sand mining in the Central Maui dunes. Exemptions were granted to parcels with an active grading permit, including Maui Lani Phase 9. The Maui County Planning Department contends that a grading permit alone is insufficient, and that a County Special Use Permit must be obtained for the excavation and removal of sand.



What Should We Do About Feral Cats in Hawai‘i?

by **MAKA‘ALA KA‘AUMOANA**



WITH AN ESTIMATED ONE MILLION FERAL CATS ON THE LANDSCAPE, HAWAI‘I’S FRAGILE NATIVE BIRD AND BAT POPULATIONS ARE AT REAL RISK OF EXTINCTION. The issue of feral cats is global, but in Hawai‘i the threat is magnified by the temperate climate, lack of predators, and vulnerability of native fauna with no instincts for defense against predation.

For instance, ground nesting water birds and seabirds don’t recognize a cat as a threat and don’t react. They simply stay on their nests while cats steal their offspring and/or attack the parents. But there are no safe places as cats are “on the landscape” on all Hawaiian islands.

Because of the problems caused by feral cats, Hawai‘i’s academic and political entities have been working to address the issue through research and potential policy. None of this work is without controversy and the uniqueness of Hawai‘i’s challenge does not dampen the fervor.

The island of Kaua‘i is particularly important for Hawai‘i’s native birds because one key predator, the mongoose, has not established itself on the island and many of the rare and endangered birds are holding on to diminishing habitat. However, cats in 52 known feral cat colonies are being fed by well-intentioned residents and visitors. These colonies have been mapped by the Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife. Many of these colonies are located in coastal areas.

But cats are not simply found in colonies near the shore. Cats are also found in remote areas that should be safe havens for birds.

For instance, three species of endangered seabirds that take refuge in the steep slopes of the Hono O Nā Pali Natural Area Reserve—Hawaiian Petrels (‘a‘o), Newell’s Shearwater (‘u‘au), and the Band-rumped Storm petrel (‘akē ‘akē)—have been killed by cats. While breeding colonies of these seabirds elsewhere on Kaua‘i face threats from anthropogenic sources such as light pollution and power line strikes, the colonies in Hono O Nā Pali are relatively unaffected by such threats given the lack of human habitation and infrastructure on the northwest coast of the island. Trapping for the shy, wary cats that inhabit these wilderness areas requires constant effort, great expense, and attention to detail. A wobbly trap or a bit of exposed wire could mean the difference between removing a risk to seabirds or not.

The issue of feral cats is ubiquitous globally, but in Hawai‘i the threat is magnified by the temperate climate, lack of predators, and vulnerability of native fauna with no instincts for defense against predation.

To monitor predation, motion-triggered trail cameras capture animals moving through an area and show when a cat attacks a nesting bird, its eggs, or chicks. These trail cameras allow for traps to be more effectively set in response to a predator’s presence. Recently a cat was detected on camera in a seabird colony, which upon closer inspection was an injured Hawaiian petrel that had been partially dug out of its burrow. The bird had deep lacerations in its wings and was brought to Save Our Shearwaters for rehabilitation.



Predator control teams immediately set traps in the areas where the cat had been seen on camera, and the cat was captured and removed the very next morning.

Cameras have recorded cats preying on birds. The loss of just one bird can have tremendous impacts on fast declining populations, but the loss of a breeding pair and their chicks is devastating. In many cases in Hawai'i the loss of even one pair of birds poses a significant challenge to their long-term existence.

The island of Lāna'i has constructed a “cat sanctuary” to contain feral and friendly cats in an attempt to prevent their predation. The facility can hold approximately 400 cats, is full and has become an attraction for visitors to the island.

On Hawai'i Island, research has focused on cat predation and diseases spread by cats that affect such birds as the endangered palila and the critically endangered 'alalā (the Hawaiian crow). The disease of most concern is toxoplasmosis, which was found in several 'alalā. Beyond research, the 'u'au (Hawaiian petrel) is receiving new protection with the construction of a cat-proof fenced enclosure.

In addition to the “take” of endangered native species, some federal researchers have suggested that feces from the feral cats roaming Hawai'i is spreading a disease that is killing Hawaiian monk seals, some of the world's most endangered marine mammals. The problem stems from a parasite common in cats that can cause toxoplasmosis, a disease that has killed at least five female Hawaiian monk seals and three males since 2001, according to the National Oceanic and Atmospheric Administration (NOAA).

“While eight seals may not sound like a lot of animals, it actually has pretty large ramifications for an endangered population where there's only about 1,300 seals in existence at this point in time,” said Michelle Barbieri, veterinary medical officer for NOAA's Hawaiian monk seal research program.

Some scientists believe monk seals become exposed to toxoplasmosis by ingesting contaminated water or prey in which oocysts are present.

They indicate that felines are the only animals that can shed *Toxoplasma gondii* oocysts, which are akin to a seed or egg in that they are a resting stage for the organism until it finds a host. The parasites enter their digestive tract through infected prey then multiply in the small intestine and produce the eggs. Outdoor cats excrete the eggs in their feces, which researchers say washes into the ocean. Ecologists in California have developed a number of models that strongly indicate that oocysts wash down watersheds into the ocean where they ultimately end up in the marine food web. Thus, in the case of Hawai'i, the oocysts accumulate in invertebrates that live along the sea floor and consumed by monk seals when they are feeding. One of the challenges of the parasite is that the oocysts are very insensitive to the environment as they can survive in fresh water, saltwater and soil for up to two years and likely longer (studies have not been done for longer periods of time to understand how long the oocysts can survive).

Birds and seals may not be the only species susceptible to toxoplasmosis. Humans also may be at risk from the disease, which can damage the immune system and has been linked to mental illness. Toxoplasmosis is of particular concern during pregnancy, as infection can result in miscarriage or birth defects.

What Should We Do About Feral Cats in Hawai‘i?, con't

There is disagreement over whether the maintenance of feral cat colonies is even in the interests of feral cats. Researchers estimate the lifespan of outdoor cats at just three years, compared to 12 – 18 years for indoor cats. The American Humane Association notes that outdoor cats have more diseases and parasites, including feline leukemia, feline AIDS, and intestinal worms. People for the Ethical Treatment of Animals (PETA) recently released a statement questioning whether trap, spray-and-neuter, and release programs and managed feral cat colonies are truly in the cats' best interests.

What do the people of Hawai‘i want in regards to feral cat management?

A survey by University of Hawai‘i researchers Cheryl Lohr and Christopher Lepczyk found that 87 percent of Hawai‘i residents want to see the number of feral cats on the landscape decrease.

These researchers concluded: “a small segment of society supports the presence of feral cats, and...the majority of people would prefer to see feral cats removed from areas with threatened native fauna.”

The State Department of Land and Natural Resources recently supported legislation to deter animal abandonment, and is supportive of finding a multi-pronged approach to this complex issue that includes adoption wherever possible, humane euthanasia where necessary, and strict control of cats in areas housing our threatened and endangered species.

Hawai‘i should consider these facts in deciding how to respond to feral cat colonies.

“The impact of feral cats is not unique to Hawai‘i... [free-ranging cats] are likely the single greatest source of anthropogenic (man-made) mortality for US birds and mammals.”

— Loss et. al 2013 (<http://www.nature.com/articles/ncomms2380>)

“There's nothing humane about treating ‘cats in the wild’ like pets”

Excerpted from Suzanne Case, Chair, Board of Land And Natural Resources Honolulu Star Advertiser, July 20, 2016

The number of feral cats in Hawai‘i is staggering, with over 300,000 on O‘ahu alone. Unfortunately, an oft-proposed solution to this problem, a method known as Trap Neuter Release (TNR; sometimes called Trap, Neuter, Release, Manage or TNRM), is itself problematic.

While the short-term goals of TNR practitioners to provide care to feral cats are well-intentioned, data show that TNR does not work toward the long-term goal of reducing numbers of feral cats. A 2009 review by Travis Longcore et al. in *Conservation Biology* compiles the results of many studies regarding TNR and concludes that the practice does not result in decreased colony sizes over time, and in some instances, has increased the size of cat colonies due to increased abandonment of unwanted pets left in someone else’s care.

TNR is not a tool for colony reduction, but rather colony maintenance.

With over 300,000 cats on O‘ahu, this is a problem for cats, native wildlife, and people alike.

There are many reasons why people in Hawai‘i should care about this problem, including one that the Department of Land and Natural Resources deals with daily: Hawai‘i has the sad distinction of being home to 28 percent of the threatened and endangered species in the U.S., and is the site of 78 percent of the country’s species extinctions.

In Hawai‘i, cats (including those from “managed” colonies) have been documented countless times killing threatened and endangered species, including Hawaiian coots, koloa maoli, nene, palila, stilts, shearwaters, and others. In June 2016, researchers on Kaua‘i captured footage of cats killing endangered Hawaiian petrels, which are particularly vulnerable as they nest on the ground.

Cats also threaten native wildlife as the host of the toxoplasmosis parasite. A single cat can excrete 145 billion toxoplasmosis eggs per year in its feces, which can persist in soil or be carried by runoff into our oceans. The National Oceanographic and Atmospheric Administration has recorded at least eight endangered Hawaiian monk seal deaths attributable to toxoplasmosis, as well as the death of a spinner dolphin.

Toxoplasmosis can also infect Hawai‘i’s birds, including nene and ‘alalā.

If wildlife and human beings aren’t reason enough to be concerned about the maintenance of feral cat colonies, consider the welfare of cats themselves.

Researchers estimate the lifespan of outdoor cats at just three years, compared to 12–18 years for indoor cats. The American Humane Association notes that outdoor cats have more diseases and parasites, including feline leukemia, feline AIDS, and intestinal worms.

OEQC 2017 Publication Data

The Office of Environmental Quality Control (OEQC) publishes environmental assessments (EAs), environmental impact statements (EISs), and other environmental review documents on the 8th and 23rd of each month, per statutory and administrative requirement.

Tracking a project or program (“an action”) as it goes through environmental review can be straightforward or complex. Most actions are EAs that have a draft and final and then are finished. In the case of a typical EA, the OEQC counts the action itself as 1 (referred to as “unique”) and the publications as 2, because it is the same action published twice (draft and final). For EISs, typically one action has 3-4 publications (preparation notice, draft, final, and acceptance).

Counting becomes more complex when an action changes over time or repeats steps in the process. For example, this year one action published two EIS preparation notices because it changed the scope of what it proposed to do after feedback from the first preparation notice.

The four tables included here show the distribution of 117 unique actions based on stage of the process, location, and agencies involved, totaling 164 publications.

Table 1 shows the total publications by stage of the process. By chance, there were 58 publications of Draft EAs and Final EAs.

Table 2 shows how many projects and programs are done by island. No projects are proposed for Ni‘ihau and in 2017 none were proposed for Kaho‘olawe. The Statewide category is for actions that occur across the state.

Table 3 shows which state and county agencies proposed actions and how many each proposed. The State Department of Transportation and the State Department of Land and Natural Resources published the most of all agencies.

Table 4 shows which state and county agencies were responsible for applicants going through environmental review and how many unique projects and programs they oversaw.

The OEQC continues to improve its internal data collection and tracking. In the future, the OEQC will be able to include a time series to provide a better sense of activity over time.

117 unique projects and programs went through environmental review,
71 of which were by state or county agencies and
46 of which were by applicants

83 EAs (any stage) for unique projects and programs,
33 of which started and finished in 2017

30 EISs (any stage) for unique projects and programs,
18 of which started in 2017

1. TOTAL PUBLICATIONS (AGENCIES AND APPLICANTS)	164
Draft EA	58
Final EA	58
EIS Preparation Notice	19
Draft EIS	8
Final EIS	8
EIS Acceptance	4
EIS Non-acceptance	1
Supplemental EIS	1
No Supplemental EIS	1
Withdrawal	6

2. UNIQUE PROJECTS AND PROGRAMS BY ISLAND (AGENCIES AND APPLICANTS)	117
Statewide	1
Hawai‘i	20
Kaua‘i	15
Lāna‘i	1
Maui	26
Moloka‘i	3
O‘ahu	51

3. UNIQUE AGENCY PROJECTS AND PROGRAMS	71
State of Hawai'i	39
Department of Transportation	11
Department of Land and Natural Resources	10
Department of Education	7
Department of Hawaiian Home Lands	3
Department of Accounting and General Services	2
Hawai'i Public Housing Authority	2
Agribusiness Development Corporation	1
Hawai'i Housing and Finance Development Corporation	1
University of Hawai'i	1
Volcano School of Arts and Sciences	1
City and County of Honolulu	17
Department of Design and Construction	6
Department of Environmental Services	6
Board of Water Supply	3
Department of Facility Maintenance	1
Department of Planning and Permitting	1
Hawai'i County	6
Department of Environmental Management	3
Department of Public Works	2
Department of Water Supply	1
Kaua'i County	5
Department of Public Works	3
Fire Department	1
Maui County	5
Department of Public Works	4
Department of Water Supply	1

4. UNIQUE APPLICANT PROJECTS AND PROGRAMS BY APPROVING AGENCY	46
State of Hawai'i	28
Department of Land and Natural Resources	14
Land Use Commission	5
Hawai'i Housing and Finance Development Corporation	4
Department of Transportation	3
Department of Health	1
Hawai'i Community Development Authority	1
City and County of Honolulu	7
Department of Planning and Permitting	7
Maui County	6
Planning Department	3
Department of Environmental Management	1
Department of Housing and Human Concerns	1
Department of Public Works	1
Hawai'i County	4
Planning Department	4
Kaua'i County	1
Planning Department	1

Specific EAs and EISs can be found on OEQC's SharePoint at:

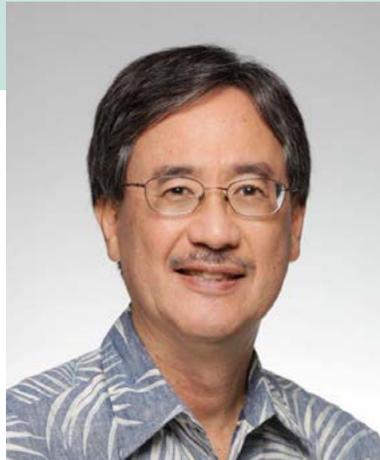
http://oeqc2.doh.hawaii.gov/EA_EIS_Library/

Environmental Council



JOSEPH SHACAT, *Chair*

Joseph attended Miami University (Ohio), where he studied philosophy and environmental science. He moved to Hawai'i in 2001, where he earned a M.S. degree in Oceanography and an Executive MBA from the University of Hawai'i Shidler College of Business. He currently works as the Environmental Compliance Manager for Grace Pacific LLC. He has advocated for improving environmental performance in the construction industry through cooperation with government agencies and active engagement with industry associations, including the General Contractors Association of Hawai'i, Associated General Contractors of America, and National Asphalt Pavement Association. Also, Joseph volunteers on the boards of the Hawai'i Yacht Racing Association and the Waikiki Yacht Club.



ROY ABE

Roy is a life-long Hawai'i resident who attended Kaimuki High School and received a B.S. degree in Civil Engineering from University of Hawai'i. He has a Master's of Science in Civil and Environmental Engineering from the University of California, Berkeley. He is a licensed civil engineer who has completed many challenging wastewater, water, and infrastructure projects during a 37-year career as a consulting engineer specializing in sanitary engineering. Roy, who is a Senior Project Manager at HDR, Inc., transitioned to part-time retired status in 2015. He continues to be actively involved in the Hawai'i Water Environment Association, the local affiliate of the Water Environment Federation. Roy enjoys talking to anyone about sewers, sewage pump stations, sewage treatment plants and any other topic related to sewage. He is passionate about obtaining the most "bang-for-the-buck" from our precious pollution control dollars by making rational science-based decisions.



MARY BEGIER

Mary Begier is principal broker and owner of Mary Begier Realty, with offices both on O'ahu and Hawai'i Island. She is a past president of both the Hawai'i Island Realtors (HIR) and Honolulu Board of Realtors and has 36 years of experience selling real estate across the Hawaiian Islands. She represented HIR on the Big Island Business Council, where she served as president from 2002-2003. She is also a past president of the Rotary Club of Hilo Bay for 2008-09 and the Hawai'i Island Chamber of Commerce 2009-2010. Begier served in the United States Navy, going to schools in Florida and California before being assigned to Honolulu. She served 8 years on The Hawai'i State Foundation on Culture and the Arts including one year as chair and has represented Hawai'i Island Chamber of Commerce on the Big Island Housing Foundation board. Begier prides herself in building coalitions between other business and community organizations to strengthen the ability to accomplish smart goals in the community. This brought about recognition from DLNR/HISC as Community Hero for work performed eradicating invasive weeds on Mauna Kea.



STEPHANIE DUNBAR-CO

Steph Dunbar-Co works for The Nature Conservancy, Moloka'i Program. As the East Slope Project Manager, Steph oversees activities in southeastern (Mana'e) Moloka'i where she lives, was raised, and is a fifth generation landowner.

Steph received MS and PhD degrees in Botany from the University of Hawai'i, focusing on the evolution, ecology, and conservation of the native Hawaiian flora. Her education and background have aligned to focus her efforts on the conservation of native ecosystems, long-term fresh water supply, and sustainable agriculture.

She lives with her husband and two young children on her family's ranch in Kainalu, Moloka'i.



SCOTT GLENN, OEQC Director

Scott Glenn, as the Director of the Office of Environmental Quality Control, is an *ex officio* member of the State Environmental Council.

Scott is a former appointed member to the Council and formerly served as its Chair and Vice Chair. He currently serves as the Council Rules Committee Chair.

Please refer to the OEQC members section for more information.



BARBARA MAKA'ALA KA'AUMOANA

Barbara "Maka'ala" Ka'auamoana was born in Kāne'ohe, Hawai'i in 1948. Educated throughout the Pacific and California, she pursued careers in both nursing and public school teaching before returning "home" in 1989. Always active in environmental education and conservation organizations and activities, she soon became involved in local projects supporting community management of cultural and environmental resources. In 1999 she was elected by the Hanalei community to head the newly formed Hanalei River Hui. Maka'ala believes in community participation and transparent process and has continued to guide this organization through the founding of the nonprofit, Hanalei Watershed Hui, and the development and implementation of the Hanalei Watershed Action Plan, the Targeted Watershed Initiative project, the Hanalei Makai Watch Program, Hanalei Watershed Management Plan, and the Hanalei to Hā'ena Disaster Resilience Plan. Maka'ala and her husband, a native Hawaiian, live on the north shore of Kaua'i, have a small banana farm, and enjoy fishing and family time.

Environmental Council



**PAULETTE KA'ANOHIOKALANI
KALEIKINI**

Paulette Ka'anohiokalani Kaleikini serves as a Lead Cultural Resource Monitor & Manager and Native Hawaiian Cultural Advisor. Ms. Kaleikini has years of experience with environmental assessments and environmental impact statements, including archaeological monitoring plans, archaeological inventory surveys, archaeological data recovery plans, burial treatment plans, and cultural impact assessments, in line with Section 106 of the National Historic Preservation Act and Native American Grave Protection and Repatriation Act.



IAN ROBIN KAYE

In 1974, Robin and his wife moved to Lāna'i to document a threatened lifestyle as the island was facing a transition from a pineapple plantation economy to resort development. As a result of that effort, he published a photographic documentary called *Lāna'i Folks*. Shortly thereafter, Robin began a career in the arts and nonprofit sectors, working for the Hawai'i State Foundation on Culture and the Arts, the California Arts Council, the Pennsylvania Council on the Arts, and the Pittsburgh Cultural Trust. In 1992, he and a partner launched the management consulting firm of Dewey & Kaye, Inc. (DKI), which worked with nonprofit organizations, foundations and government agencies. Robin's work with nonprofits involved board development, long range planning, and executive searches for foundation program staff and nonprofit executive directors. Robin was one of the original founders of the Lāna'i Limu Restoration Project, and currently serves as spokesperson for Friends of Lāna'i.



**THERESITA BALLMORES
KINNAMAN**

Theresita's interest and service for the Council is due to her upbringing, during territorial and plantation days, when the environment and natural resources were fresh, plentiful, clean, and life was simple, fun, honest and about how we cared for the island's land, ocean, streams, natural resources and not deplete these life sustaining resources. Today, with development of once open lands and spaces, land-based activities are straining the environment and natural resources.

Her involvement in community service has spanned 30 plus years advocating for community needs pertaining to environmental, archeology, and natural resources, among other concerns; all that our sense of place, and identity to hopefully recharge and preserve for future generations to a highly sustainable level.



ROBERT PARSONS

Appointed in May 2015, Rob is in his 11th year of serving as Maui County Environmental Coordinator, a position first created by Mayor Alan Arakawa. He serves as liaison to county, state, and federal agencies and many non-profit conservation organizations, including watershed partnerships and Maui Invasive Species Committee. He also is the ad hoc Sustainability Liaison and is part of the Hawai'i Green Growth Core and Measures Teams, supporting the goals of the Aloha+ Challenge. Rob is a well-known free-lance writer and environmental advocate, with over 180 articles published since 2007. He is a 35-year Hawai'i resident, originally from the Midwest, as is his wife Heather. "I feel it is essential to learn as much as I can about issues that affect us all, and share that information so people can make informed decisions as part of establishing a future with the ability to sustain ourselves and the multitude of other living species with whom we share this fragile planet." Rob also chairs the Environmental Council Annual Report Committee.



CHUCK PRENTISS

Chuck is a former city manager and retired city planner with the City and County of Honolulu. He holds degrees in economics, planning, and government management. He is a former Executive Secretary of the Honolulu City Planning Commission, a Vietnam veteran pilot, and a retired Lieutenant Colonel of the Hawai'i National Guard. Chuck is also President of Hawai'i's Thousand Friends and former Chairperson of the Kailua Neighborhood Board. Chuck possesses a strong belief in citizen participation in government. For him, "participation aids in government openness and honesty, and provides a countervailing force to special interests in government decisions. In Hawai'i, the environment is our economy."



RON TERRY

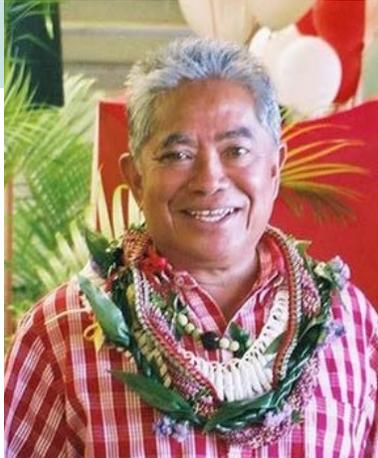
Ron Terry is a graduate of University of Hawai'i Hilo and has a PhD from Louisiana State University. After five years as a professor of Geography at University of Hawai'i Hilo, he started Geometrician Associates in 1992. He has worked solely or teamed with others to prepare nearly 500 environmental assessments, environmental impact statements, and biological reports for projects throughout the Hawaiian Islands. Clients include many federal, state and county agencies as well as private sector firms. He has served on three state boards and several non-profits. Married with two grown daughters, he also surfs, kayaks, travels, and plays senior softball.

Environmental Council



PUANANIONAONA P. THOENE

Puananionaona P. Thoene was born on O‘ahu and raised in Hilo. She is a graduate of the Kamehameha Schools, Kapālama Campus. Onaona received her J.D., magna cum laude, from the University of Hawai‘i at Mānoa, William S. Richardson School of Law with certificates in environmental law and native Hawaiian law, and a B.B.A., cum laude, from the University of San Diego. Onaona is a fifth-year associate at Carlsmith Ball LLP in the Honolulu office. Her practice focuses on real property, environmental, business and corporate law, land use, and administrative law. She is also a member of the O‘ahu Island Advisory Council for the Hawaiian Islands Land Trust.



MIKE TULANG

Mike entered the federal service in 1967 with U.S. Department of Agriculture, National Resource Services, serving in a variety of responsibilities. He was a Watershed Planning Economist, District Conservationist, Resource Conservation, and Developer Coordinator for Maui County, Hawai‘i County, and the State of Hawai‘i. He retired after 31 ½ years of federal service and accepted an executive position with the State Association of Conservation Districts for 7 years. He then went on to serve for 2 years as a councilman on the Hawai‘i County Council, followed by 3 years of substitute teaching at his former elementary school. He has served his community as Director of the Boys and Girls Club and the Hawai‘i Agricultural Cooperative, as a Board Member of HIWEDO, and as a Certified Trainer at Positive Coaching. His hobbies include fishing, hunting, cattle ranching, and singing.



MAHINA TUTEUR

Mahina is currently a Post-Juris Doctor Research & Teaching Fellow at the Ka Huli Ao Center for Excellence in Native Hawaiian Law, where she co-teaches the Environmental Law Clinic and is responsible for designing and facilitating legal workshops to empower communities across the pae‘āina. She has worked on policy advocacy and natural resource management issues for various non-profit and government agencies, and has also worked in state and federal courts. Mahina received her J.D., magna cum laude, from the William S. Richardson School of Law with certificates in Environmental and Native Hawaiian Law, and a B.A. from the University of San Diego.

OEQC Staff



SCOTT GLENN, OEQC Director

Scott Glenn, AICP, is the Director of the State of Hawai'i Office of Environmental Quality Control. He advises the Governor on environmental matters and serves as the Co-Chair of Governor Ige's Sustainable Hawai'i Initiative, focusing on supporting state and county agencies with climate change adaptation. Scott is also currently leading the effort to update the administrative rules as Environmental Council Rules Committee Chair.

Prior to coming to the OEQC, Scott worked as an environmental planner in the private sector. He focused on planning, environmental review, asset management, and risk analysis in clients' strategic decision making. He has managed project budgets and held key roles on multiple multi-million dollar projects for clients in the public and private sectors.

Scott earned a B.A. in philosophy and classical archaeology from the University of Evansville and a Master's in Urban Regional Planning from the University of Hawai'i.



LESLIE SEGUNDO

After completing a baccalaureate in chemistry, Leslie Segundo worked with the Solid and Hazardous Waste Branch of the Department of Health for several years before transferring in 1991 to the Office of Environmental Quality Control. He continues to provide professional support for the Environmental Council and assists in the day-to-day operations of the Office.



THOMAS EISEN

Truthfully a geographer, Tom Eisen has been engaged with Hawai'i's planning community for over 25 years. Presently serving as the senior planner in the Office of Environmental Quality Control, Tom also has natural resource planning experience with the Coastal Zone Management Program and the Office of Conservation and Coastal Lands. His planning perspective has been broadened by employment with two county planning departments, as well as working as a sole proprietor consultant and with a large local planning firm. Preferring to surf and practice yoga in his free time, Tom has also been a Neighborhood Board & Community Garden Board member, volunteered as a docent at the Waikiki Aquarium, and built yurts, permaculture gardens, and photovoltaic systems.

Endnotes, credits & acknowledgments

Endnotes/References

Climate Change:

- 1 [Five pacific islands lost to rising seas as climate change hits](#). The Guardian, May 10, 2016.
- 2 Spanger-Siegfried, Erica, Kristina Dahl, Astrid Caldas, Shana Udvardy, Rachel Cleetus, Pamela Worth, Nicole Hernandez Hammer, July 2017. [When Rising Seas Hit Home: Hard Choices Ahead for Hundreds of US Coastal Communities](#). Union of Concerned Scientists.
- 3 Hawaii Climate Change Mitigation and Adaptation Commission. 2017. [Hawaii Sea Level Rise Vulnerability and Adaptation Report](#). Prepared by Tetra Tech, Inc. and the State of Hawaii Department of Land and Natural Resources, Office of Conservation and Coastal Lands.
- 4 Emanuel, Kerry A. [The dependence of hurricane intensity on climate](#). Nature, 326. April 2, 1987.
- 5 Emanuel, Kerry. [Increasing destructiveness of tropical cyclones over the past 30 years](#). Nature, 436. August 4, 2005.
- 6 [Rains from Hurricane Harvey broke 60 years of US continental records – here’s why](#). Business Insider. August 29, 2017.
- 7 [Hurricane Irma blasts into the record books with lasting intensity](#). National Public Radio. September 12, 2017.
- 8 [Parts of Puerto Rico won’t have power for 8 months. What’s the holdup?](#) The New York Times. December 23, 2017.
- 9 University of Hawaii at Manoa Sea Grant College Program. June 2014. Climate Change Impacts in Hawai‘i.
- 10 Union of Concerned Scientists. April 2017. [Clean Energy Momentum – Ranking State Progress](#).
- 11 CleanTechnica. November 24, 2017. [Top State in US for Electric Vehicle Concentration = California \(#MapFun\)](#).
- 12 Fast Company. December 21, 2017. [Hawaii’s Mayors Just Committed to 100% Renewable Transportation by 2045](#).

OTEC:

- 1 Wang, C. M. , Yee, A. A. , Krock, H. and Tay, Z. Y.(2011) [‘Research and developments on ocean thermal energy conversion,’](#) The IES Journal Part A: Civil & Structural Engineering, 4: 1, 41 – 52.
- 2 Energy Harvesting Systems. http://energyhs.com/about_us.
- 3 <http://evworld.com/article.cfm?storyid=1008>

Sands of Time:

- 1 <http://www.mauinews.com/news/local-news/2018/01/council-oks-sand-mining-moratorium/>
- 2 <https://sustainabledevelopment.un.org/post2015/transformingourworld>
- 3 <http://khon2.com/2017/04/27/sustainability-cultural-issues-raised-as-sand-disappears-from-central-maui-dunes/>
- 4 <https://lintvkhon.files.wordpress.com/2017/04/mauiinlandsandquantitystudy.pdf>
- 5 Doak C. Cox, “The Spreckelsville Beach Problem”, August, 1954.
- 6 Moberly et al. 1963. [Hawai‘i’s Shoreline](#).

Photo Credits

GPI, p. 11, Donella Meadows Institute, 2014; OTEC, p. 15, National Renewable Energy Laboratory (NREL); p. 17 (both photos), Energy Harvesting Systems, LLC; Maui Sand, pp. 19 and 21, Iwi Protectors; and Feral Cats, p. 23, U.S. Fish and Wildlife Service.

The Council would like to thank the public for their engagement with the Council on rulemaking and these issues and give a special thanks to Stephanie Chang for her support in preparing this report template.





**THE STATE ENVIRONMENTAL COUNCIL
THE STATE OFFICE OF ENVIRONMENTAL QUALITY CONTROL**

<http://health.hawaii.gov/oeqc/>

235 South Beretania Street, Suite 702
Honolulu, Hawai'i 96813
(808) 586-4185
oeqchawaii@doh.hawaii.gov