

Local Civil Engineers Explore Ways to Protect Infrastructure from Climate Change Impacts

I can't tell you how many ulcers I get in a matter of hours when there's a possibility I could lose 30 pump stations in one event," said Timothy Steinberger, the former director of Honolulu's Department of Environmental Services.

The cause of Steinberger's ulcers was the city's wastewater system, much of which is located along coastlines or in areas vulnerable to flooding.

With climate change and associated sea level rise, some of O'ahu's most critical infrastructure — Honolulu harbor, the Honolulu International Airport, sewage treatment plants and pumping stations, and

chapter of the American Society of Civil Engineers and local law firm Carlsmith Ball, LLP, featured panel discussions with local engineers and planners, including Steinberger, and a series of talks by William Wallace, co-creator of the Envision rating system, which, similar to LEED, is aimed at producing sustainable projects.

"There are a lot of things that are happening that are pretty scary," Wallace said. Along with anticipated changes in storm intensity and temperature, new engineering solutions will be needed as engineers become less able to trust the "body of knowledge of how things have historically

it to be more robust to account for unusual or extreme circumstances; 2) identify an adaptation strategy so that when conditions change beyond a certain point, "we'll adapt to another level;" and 3) design so that if the project is, for example, damaged by a storm, operations can recover quickly.

As an example, he described efforts by city of Olympia, Washington, to design a suite of engineering solutions to be incrementally implemented as sea levels rise. They include tide gates, various kinds of barriers, outfalls, and pump stations, among other things.

Like Honolulu, much of Olympia's critical infrastructure sits in low-lying areas. And with the city located at the base of Puget Sound, those areas are particularly vulnerable to flooding.

Research has shown that even a small rise in sea level greatly increases the probability of flooding in Olympia's downtown area. Lands identified in the past as being vulnerable to impacts of a 100-year flood would be affected every 18 years if sea level were to rise just half a foot, according to a 2011 City of Olympia Engineered Response to Sea Level Rise technical report.

The report specifies the location, type, and cost of structures that need to be installed with each incremental change in sea level. For example, the report recommends that flood barriers be installed at certain locations on the west facing shoreline of the city's peninsula before sea level rises a quarter of a foot, and along the east facing shoreline before it rises half a foot. If sea level rises by 50 inches, the report recommends that the barriers be increased in height.

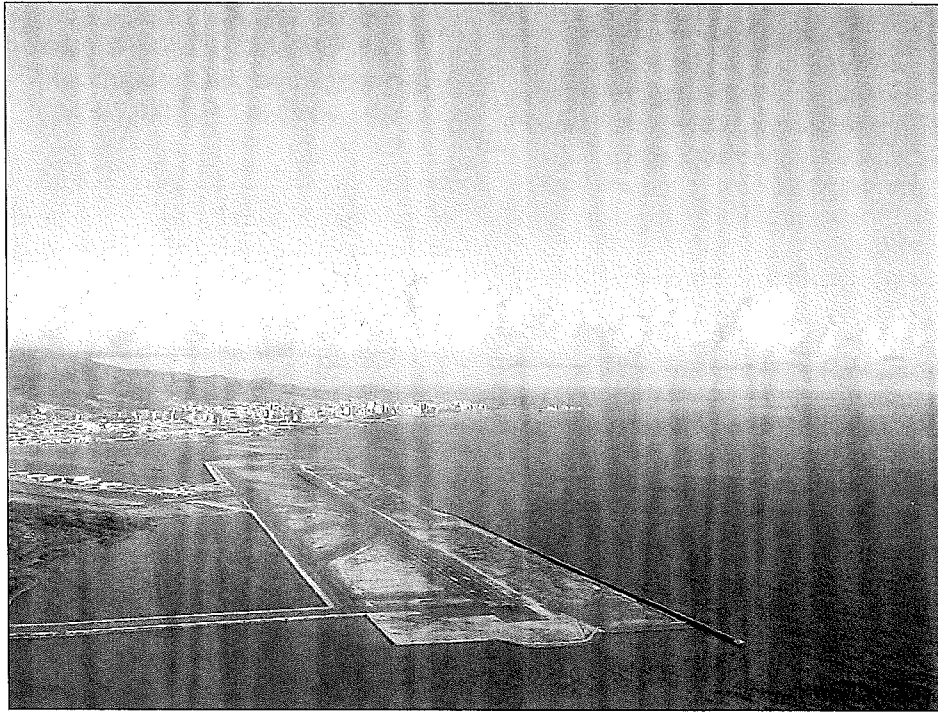
The cost for the various barriers needed to manage a rise in sea level of one foot was estimated at about \$8.5 million. With a four-foot, two-inch rise, the cost grows to \$13.6 million. Additional costs include \$30 million for a 500 cubic-foot-per-second pump station, and \$7.5 million for two smaller pump stations.

Whether or not such projects will receive full funding remains to be seen, but Wallace said the city has already designed a boardwalk with adaptability in mind. It was designed to last 25 years rather than the standard 50 years, and is both flexible and saltwater resistant.

He then asked seminar attendees, "Is anyone doing anything that deals with adaptation in this way? Are we all linear?"

"Uh-oh," he said, on seeing not a single hand raised.

Granted, civil engineers are "at the bottom of the food chain" and, generally, get told what to do, he said.



Honolulu International Airport Reef Runway

electrical and transportation systems — are vulnerable to flooding.

A recent modeling study by University of Hawai'i scientists on the combined threat of a 1-meter rise in sea level and tsunami or hurricane inundation found that \$34.8 billion, or 80 percent, of the economy located along Honolulu's urban core may be affected by the combined hazard.

At a one-day infrastructure sustainability seminar in downtown Honolulu last month, dozens of local engineers discussed the need to design projects to weather the impacts of climate change.

The seminar, sponsored by the Hawai'i

operated," he said.

Although researchers globally have been trying to characterize anticipated, local impacts of climate change, Wallace stressed that infrastructure projects must account for unforeseen conditions.

"There may be tipping points beyond which we don't know what is going to happen," he said.

Contingency Planning

Whether the concern is temperature change or sea level rise, engineers have three ways they can incorporate sustainability into a project, Wallace said. They can: 1) design

"We're trying to give you that information so you can knock on the project manager's door and, for example, convince him or her not to put a road right next to the shoreline," he said.

He admitted that education may not be enough in some cases.

"There is high resistance to change by owners and operators of existing systems that have a stake in the status quo," he said.

Regulators here may also still be struggling with how to incorporate the sea level rise and coastal inundation research released over the past year or so. Modeling has shown that in Honolulu and Kaka'ako, flooding as deep as 1.5 meters could reach Beretania Street, located just mauka of the core of downtown Honolulu. In the back of the Mapunapuna industrial area, at Pearl Harbor, Waikiki, and the airport's reef runway, flooding could be as deep as two meters.

The modeling also identified, on a block-by-block basis, which parts of the upcoming rail system are vulnerable to inundation hazards.

At last year's Ocean Sciences conference in Waikiki, University of Hawai'i's Dolan Eversole, who participated in the sea level modeling work unveiled last year, said he saw some "very surprised looks" when he presented the information to local managers.

They were not sure what to do and kept asking him, "So now what?" he said.

Last year, the state Legislature established a committee to complete a sea level rise vulnerability and adaptation report by December 2017. Whether it will identify specific actions needed to protect infrastructure remains to be seen.

O'ahu's broader planning documents — the General Plan and the Sustainable Community Plans for the island's different regions — generally have not factored in climate change impacts, according to Steinberger, who now works at HDR, a private engineering company.

"A lot of the plans don't even take into account the possibility of sea level rise. ... Projects going out right now don't take into account sea level rise. Plans for wastewater components don't even take into account tsunami or hurricane inundation," he said.

"When you look at the General Plan, it does need to be redone and take into account what is happening in the world," he added. A draft general plan is expected to be released this fall.

When it comes to getting funds for

sustainability projects, Steinberger said the city council often argues they're unaffordable and questions whether they're really necessary.

In planning for a sustainable future, Steinberger said, "you've got to fight for these things all the time. Unfortunately, we lose a lot of the time. That's what gives you a lot of grey hair."

Effecting Change

When asked how to generate the political will to make the necessary infrastructural changes, Wallace admitted that it's difficult given the costs involved and the "nitwits" in certain governmental positions who are still declaring that climate change isn't happening.

He even criticized the ASCE, stating that its greenhouse gas emissions policy is "full of crap."

"It's still hemming and hawing," he said, despite the society's code of ethics that calls for engineers to take into account public health, safety and welfare. Ignoring or minimizing climate change is an ethical violation of "what our duty is as engineers."

He suggested that engineers need to start telling politicians things they don't want to hear.

Ian Sandison, an attorney with Carlsmith Ball and a former engineer, challenged local engineers to start developing a set of criteria for sustainable infrastructure that can find its way into specifications issued by agencies such as the U.S. Army Corps of Engineers and the Honolulu Department of Planning and Permitting.

"There is nobody that doesn't say, 'My project is sustainable.' There is almost no agreement on what that word means," said Sandison.

Simply discussing sustainability in a

For Further Reading

- "City of Olympia Engineered Response to Sea Level Rise," by Coast & Harbor Engineering: <http://olympiawa.gov/community/sustainability/-/media/Files/PublicWorks/Sustainability/Sea%20Level%20Rise%20Response%20Technical%20Report.ashx>

- Combined sea level rise inundation risk map for urban Honolulu: <http://oos.soest.hawaii.edu/pa-cioos/projects/slr/>

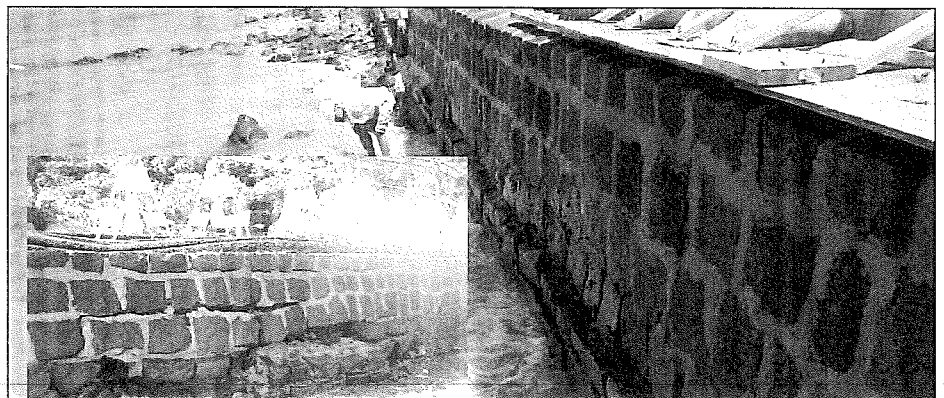
- "Doubling of coastal erosion under rising sea level by mid-century in Hawai'i," *Natural Hazards*. Tiffany R. Anderson, Charles H. Fletcher, Matthew M. Barbee, L. Neil Frazer & Bradley M. Romine (2015). <http://link.springer.com/article/10.1007%2F11069-015-1698-6>

project's environmental impacts statement didn't seem adequate to him. Those statements "just talk about impacts, but don't really have a metric," he said.

"How can we provide a legal incentive for a more sustainable project rather than a less sustainable project?" he asked. Absent new "sustainability" metrics, on a "very micro level," engineers can adopt the standards in the Envision rating system, he added.

"Put it in your specs and make it work. All of you can do it. You don't need legislation. It's within your power to make a significant change here," he said

— T.D.



Emergency repairs of coastal infrastructure are expensive and disruptive. To repair this 610-foot stretch of Kamehameha Highway in Ka'a'awa — part of which crumbled onto the beach earlier this year — the state Department of Transportation has set aside \$8 million. As of last month, the department was still considering whether to close the road entirely or partially, and whether work would occur 24/7 or only during the day. The highway is the only route in or out for the thousands of residents from Kahalu'u to Wahiawa. Construction is expected to begin this month and end in August.

Ige Supports Construction of TMT, Asks UH to Better Manage Mauna Kea

UPDATE: University of Hawaii President David Lassner agrees stewardship of the mountain can be improved.

MAY 26, 2015 · By ANITA HOFSCHEIDER

Hawaii Gov. David Ige announced his support for building the Thirty Meter Telescope on Mauna Kea on Tuesday, saying the project has the right to proceed.

“I do not doubt that they did more than any previous telescope project to be a good neighbor,” he said during a press conference at the State Capitol.

Protests against the planned observatory on Mauna Kea, which is considered a sacred mountain by many Native Hawaiians, forced construction to come to a standstill last month after dozens of people were arrested blocking construction vehicles.



Gov. David Ige speaks at a press conference about the TMT on Mauna Kea.

The governor also announced a list of 10 requests for the University of Hawaii that are intended to improve the management of the mountain, such as creating a new Mauna Kea Cultural Council to

advise the state. Ige acknowledged that in many ways the state has failed to do a good job as steward of the land.

Still, Kealoha Pisciotta, who has spent a better part of the last two decades fighting development on Mauna Kea, said she was disappointed by the governor's support for the TMT.

"The state of Hawaii is defending astronomers from California's right to build something here on the land that belongs to Native Hawaiians and the public," she said. "He's arresting our people, Hawaiian and non-Hawaiian alike, but he's going to defend the California astronomers' right to build something here."

She called his list of requests for the university "hollow" and said they included things that the university was already planning on doing, such as decommissioning telescopes.

She said she doesn't plan to apply to serve on the governor's proposed Mauna Kea Cultural Council.

"Hawaiians should not be in an advisory position, they should be in a voting position because it's their land," Pisciotta said.

"The people have already spoken that we are willing to take arrests if need be."

Ige said the University of Hawaii needs to do a better job of taking care of the mountain. He said the pursuit of science on the mountain has gotten in the way of culture, and the state must restore the balance.

"From my own personal experience on the mountain, with all the noise and crowding, I could not feel the same feeling that I felt on the summit 20 years ago," Ige said of his recent visit to Mauna Kea.

Cory Lum/Civil Beat



Observatories dot the summit of Mauna Kea.

He announced that he is asking the University of Hawaii to enter a legally binding agreement to ensure that this is the last area on Mauna Kea where a telescope could be built, as well as decommission at least one-fourth of the telescopes on the mountain by the time the TMT is complete.

Ige also wants UH to return over 10,000 acres to the state Department of Land and Natural

Resources that aren't being used for the observatories, and to substantially reduce its lease extension request.

He said the university should re-start the environmental impact assessment for its application for a lease extension and conduct a full cultural impact analysis. The governor also wants the TMT to increase its educational support for Native Hawaiian students.

University of Hawaii President David Lassner said during a subsequent press conference Tuesday that he believes the governor's requests are generally reasonable and the university is not opposed to returning land to the DLNR or decommissioning telescopes.

"We agree that the university can and must do better and we apologize for where our efforts have fallen short," Lassner said, acknowledging that the university could do more regarding cultural stewardship and decommissioning telescopes.



Cory Lum/Civil Beat

University of Hawaii President David Lassner speaks at a press conference about Mauna Kea.

Still, when a reporter asked if Lassner agreed with Ige that science has taken precedence over culture on the mountain, the president didn't respond directly.

"I believe that there is more we can do to enhance our cultural stewardship of the mountain," he said.

He said the university will issue a more comprehensive statement later this week that will describe

what specific actions the university will take.

Henry Yang, chair of the TMT International Observatory Board, said in a statement that the organization is grateful for Ige's support and will work with his proposed framework.

"We know we have a lot of work ahead of us," he said. "We appreciate that there are still people who are opposed to the project, and we will continue to respectfully listen and work with them to seek solutions. We also want to acknowledge and thank our many supporters on the Big Island and beyond."

A spokeswoman for the TMT said she didn't know when construction will proceed.

Read Gov. Ige's prepared remarks below:



Remarks of Governor David Ige as prepared

THE MAUNA KEA STORY MAY 26th

My role as Governor is to represent all the people of Hawai'i our people, especially on critical and controversial matters.

The issues surrounding Mauna Kea are contentious and on all sides very strongly felt. And because of that, the search for answers is very challenging and difficult.

In moving forward, I believe our core values need to be:

- The importance of respecting our host culture and the special places of Hawai'i.
- The critical role that science and technology play in the economic and educational life of our community. Our young people need to reach for the stars, literally and figuratively.
- Respect for the laws and the process of seeking and receiving approvals to do work in Hawai'i.
- The need in all of our work as government, and as people, to take the time to listen, and to learn, from each other and especially from those who feel they have not been heard.
- To act always with aloha.

In reflecting on those values, we have in many ways failed the mountain. Whether you see it from a cultural perspective or from a natural resource perspective, we have not done right by a very special place and we must act immediately to change that.....

TMT went through the appropriate steps and got the appropriate approvals. I do not doubt that they did more than any previous telescope to be a good neighbor

Check out the [robust discussion about Mauna Kea and the Thirty Meter Telescope](#) in our new [Connections](#) section. Click the red pencil to write your own commentary.

State monitors black band coral disease on Kauai reefs

By Web Staff

Published: April 29, 2015, 1:50 pm | Updated: April 29, 2015, 9:18 pm



The state Department of Land and Natural Resources is closely monitoring the presence of black band disease on coral off Kauai.

Officials said the disease was found at nearly half of the reef sites surveyed in near-shore waters.

It gets its name from the black band lesion, or wound, that it forms on the coral. This lesion will quickly progress until the coral colony is completely dead.

Researcher Chris Runyon and her team surveyed 47 coral reef sites over the past year and found the disease in 23, or 48 percent, of them.

“A weak relationship was found between the abundance of the disease and water temperature. The lesions caused by black band disease become more active in the summer,” she said.

“This was a disease first identified on Kauai back in 2004 by researchers at HIMB, Hawaii Institute for Marine Biology. It was then seen in higher levels in 2012, what we would consider to be an outbreak of the disease, so it was higher from what we seen before,” explained Anne Rosinski, DAR marine resource specialist.

Previous work established the disease is affecting three species of Montipora, or rice, corals and also showed disease “hotspots” at Makua and Anini beaches.

“We actually took portions of the material and brought it back to the lab to fulfill postulates on the disease to see what we’re up against and we were able to identify three different kinds of bacteria that are responsible similar to the bacteria of black band disease found elsewhere,” Runyon said.

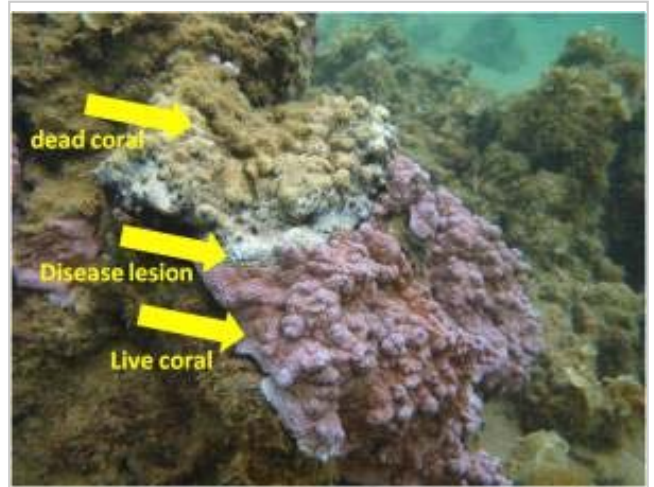
A management response team, established by the DLNR Division of Aquatic Resources and various partners, continues to investigate the connection between the disease and environmental factors.

“What we’re thinking is that these microbes are in the environment and they’ve always been and they are just, over time, with these corals becoming stressed, we have sedimentation,” Runyon said, “or you have temperature changes, or you have pollutants... Something is stressing these corals out because when you go to some of these sites where we see black band at, they don’t look very good.”

Hawaii Institute of Marine Biology scientists previously used a novel putty treatment, which was successful in reducing the amount of coral tissue death from the disease.

Experts working to find the cause of the disease and to identify additional treatments continue to ask ocean users to report new coral disease outbreaks to **The Eyes of the Reef Network** (<http://eorhawaii.org/>).

Click here (<http://dlnr.hawaii.gov/reefresponse/kaua%20CA%20BBi-black-band-disease/%20>) for more information on black band coral disease and to view a final report authored by HIMB.



A coral colony with the black band disease showing dead coral, the disease lesion and live coral (Photo: C. Runyon, UH/DLNR)

Lawsuit Filed by Wetland Taro Farmers in East Maui

The state, Maui County, a sugar company and others are named as defendants in claim over diversion of water.

APRIL 15, 2015 · By CHAD BLAIR

Farmers Healoha Carmichael and Lezley Jacintho and the nonprofit Na Moku Aupuni O Koolau Hui filed a lawsuit Friday naming the state of Hawaii, Maui County and others.

The claim, according to this [Courthouse News Service article](#), is that water diversions are negatively impacting the farming of taro — kalo, in the Hawaiian language.

Also named in the suit are the Department of Land and Natural Resources, Alexander & Baldwin, East Maui Irrigation Co. and A&B subsidiary Hawaiian Commercial & Sugar Co



Hawaiian Commercial & Sugar Co. on Maui.

“The lack of stream flow threatens the survival of Hawaiian traditional and customary practices and is particularly oppressive for wetland taro farmers, who require certain minimum volumes and temperatures of water to ensure the health and vitality of their crops,” the taro farmers argued in the complaint.

The farmers also say a related decline in native species is letting invasive plants takeover. They want a court to void A&B’s permits for the diversions from East Maui streams.

Of note: The title of the Courthouse News article is “Water Problems Even in Hawaii.”

Yep. Disputes between A&B and folks in East Maui have been going on for many years, actually.

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Honolulu Mayor Signs Two Bills Aimed at Restoring Waikiki Beach

Hawaii's most famous beach is largely man-made due to severe erosion.

MAY 18, 2015 · By ANITA HOFSCHEIDER

Editor's Note: *Do you have beach erosion pics you'd like to share, old or new? Tweet them to @civilbeat, using the hashtag #civilbeach or via Facebook <https://www.facebook.com/civilbeat>.*

Honolulu Mayor Kirk Caldwell has signed two bills creating a special improvement district in Waikiki to require commercial property owners to subsidize the restoration of the eroded beach.

“Waikiki is known around the world for its legendary sun, surf, and sand,” the mayor said in a press release. “By supporting these bills to provide funding for beach replenishment, the visitor industry has stepped up to help keep iconic Waikiki Beach sandy and enjoyable for years to come.”

Hawaii's most famous beach has had erosion problems since the late-1800s when developers began erecting hotels and homes too close to the natural shoreline.

Oahu has lost one-fourth of its beaches and of those remaining, about 70 percent are eroding, largely due to the city's pattern of continuing to approve seawalls.



Honolulu Mayor Kirk Caldwell signs to bills that will help fund Waikiki Beach restoration.

Most recently, the city allowed the billionaire chairman of South Korea's Samsung Group to build two seawalls along his properties in Kahala where much of the once-sandy beach disappears in high tide.

The Waikiki special improvement district's first-year budget is \$605,000. Read Bill 81 and Bill 82 to learn more details.

Click on the interactive below to learn more about Oahu's vanishing beaches, or read reporter Sophie Cocke's story, "Oahu Faces a Future With Far Fewer Beaches":

Record Roi Round-Up

 themolokaidispatch.com/record-roi-round-up/

Molokai divers joined forces last month for a cause – to save native fish species by ridding the island of about 1,000 pounds of invasive roi.

“Nowadays everyone is about malama this, malama that. This is really giving back to the reef,” said local diver Dicky Dowling, who organized the second annual Molokai Roi Tournament. “That’s the most invasive species... Somebody gotta do something, you cannot just stand on the side.”



Divers harvested over 1,000 pounds of invasive roi in the island’s second annual tournament. Photo courtesy of Dicky Dowling.

In the 1950s, the Hawaii Department of Fish and Wildlife introduced roi as a game fish for food. However, they have now overtaken the reef and prey on native reef fish. According to an article in the Division of Aquatic Resources newsletter, University of Hawaii scientist Jan Dierking estimated that roi eat 99 tons of reef fish every year in a three-mile square area of Kona coastline. Roi also spread ciguatera, a neurological disease in humans resulting from eating fish infected with the poison. Few people in Hawaii today view roi as a food source.

This year, Dowling said 70 divers participated in the tournament and together, harvested a state record of 1,314 roi fish. That’s a big increase over last year, when 20 divers caught a little under 800 roi.

The tournament took place on March 28, and divers harvested from boats from Wavecrest to Hale O Lono during a six-hour period, said Dowling.

With a majority of Molokai divers participating, Dowling said some off-island fishermen also came over. Tournament rules mandated that they dive with a Molokai group at all times.

“[That way] Molokai guys could educate at the same time, they could experience on a first-hand basis...not just the social media stuff,” he said, referring to the negative buzz that many off-island divers hear about Molokai. “The feedback that I’m getting from the off-island guys is unbelievable right now.”