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Hawaiʻi 2050 Sustainability Plan - Ten Year Measurement Update

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Act 8 of the 2005 Special Session of the Hawaiʻi State Legislature (Act 8) established the Hawaiʻi 2050 Task Force (Task Force) to review the Hawaiʻi State Plan and the State's comprehensive planning system, to develop a statewide sustainability plan for the 21st century. Act 8 required the Office of the Auditor, after receipt of the Task Force's report, to prepare the Hawaiʻi 2050 Sustainability Plan to define and implement state goals, objectives, policies, and priority deadlines by incorporating the Tasks Force's recommendations.

In January 2008, the Office of the Auditor submitted the Hawaiʻi 2050 Sustainability Plan to the Hawaiʻi State Legislature.

While Act 8 called for "[t]he auditor, with the assistance of the office of planning [to] update the [sustainability] plan every ten years and report to the legislature," no funding beyond Fiscal Year 2007 was appropriated for the purposes of this Act. Furthermore, Act 8 called for the Hawaiʻi 2050 Task Force to sunset on June 30, 2008. Therefore, the Task Force recommended the Legislature pass a law establishing an implementing agency, the Sustainability Council, to be a continuing, governmental organization with budgetary and staffing resources essential to carry forward the Hawaiʻi 2050 Sustainability Plan. However, a Sustainability Council was never established.

Given that a Sustainability Council was never established, and that our office lacks the requisite expertise and financial resources to facilitate a full, formal update, this report represents an informal update of the Hawaiʻi 2050 Sustainability plan prepared by the Office of Planning. This informal update includes a compilation, review and analysis of available metrics originally established by the 2008 version of the Hawaiʻi 2050 Sustainability Plan, along with additional recommendations developed by the Office of Planning. This report is also accessible through the Office of the Auditor's website at http://files.hawaii.gov/auditor/Reports/2018/2018H2050.pdf.

We express our appreciation for the assistance extended by the State Sustainability Coordinator Danielle M. M. Bass in preparing this report.

Hawaii 2050 Sustainability Plan

Ten Year Measurement Update (2008-2017)

PREPARED BY:
THE OFFICE OF PLANNING
FOR THE OFFICE OF THE AUDITOR
STATE OF HAWAII

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Executive Summary

The Hawaii 2050 Sustainability Plan was published in 2008 in accordance with Act 8, Special Session Laws of 2005. Act 8, Special Session Laws of 2005 requires the State Auditor, with the assistance of the Office of Planning, to update this plan every ten years; due to a lack of funding for the update of this plan, the Office of Planning, through the State's Sustainability Coordinator, conducted an evaluation of the metrics and indicators established by the 2008 Hawaii 2050 Sustainability Plan. This evaluation and measurement was the first of its kind over the past decade. This report reviews the data collected over the course of this ten year measurement of Hawaii's progress toward sustainability according to the Hawaii 2050 Sustainability Plan's 5 goals, 9 "2020 benchmarks", 22 strategic actions, and 55 indicators.

This report found that through the course of the past ten years, the Hawaii 2050 Sustainability Plan was disregarded. The Hawaii 2050 Sustainability Plan set nine benchmarks to achieve by 2020. This report found that as of 2017, Hawaii continues to struggle with these same issues. The Hawaii 2050 Sustainability Plan also provided recommendations and next steps to assist with implementing sustainability statewide. This report found that these recommendations were either only partially implemented or not implemented at all.

Although Hawaii's sustainability ethic has strengthened over the past ten years, this ethic is primarily externally driven through climate change mitigation and adaptation reports and data, and recent international, national, and local sustainability efforts. This report found that many sustainability efforts and indicators were not implemented by government in a coordinated manner.

Hawaii lacked a permanent governmental sustainability coordinating entity over the past ten years to assist with the implementation of the Hawaii 2050 Sustainability Plan and its sustainability goals. A stronger legislative framework focusing on sustainability, the permanent establishment of a governmental sustainability coordinating entity with recognized responsibilities and authorities, and budgetary funding are necessary to develop, coordinate, and implement Hawaii's sustainability goals, priorities, and planning throughout government.

The Hawaii 2050 Sustainability Plan is outdated with some unmeasurable indicators. Funding will be necessary to perform a formal ten year update of this large plan pursuant to Act 8, Special Session Laws of 2005, with current scientific data, best practices, and indicators measuring the sustainability of Hawaii, its economy, society, and natural resources. Future sustainability coordination should include but are not limited to: assessments of Hawaii's infrastructure, water security planning and strategies, sustainable land use recommendations, and local food security planning and strategies. These areas must be examined to prepare for a sustainable Hawaii by 2050.

Legal Mandate

Act 8, Special Session Laws of 2005

On July 12, 2005, the State Legislature overrode the veto of S.B. 1592, thus enacting Act 8 Special Session Laws of Hawaii (SSLH) 2005 (S.B. 1592, SD 1, HD2, CD1) Relating to State Planning (Act 8) to create a task force to review the Hawaii State Plan and other fundamental concepts of community planning and make recommendations for the Hawaii 2050 Sustainability Plan. The law required the State Auditor to prepare the Hawaii 2050 Sustainability Plan, which would define and implement state goals, objectives, policies, and priority guidelines by incorporating some or all of the recommendations of the Hawaii 2050 Task Force. The Legislature found that "planning the overall theme and goals of the State was important to our future success, and that there were many real, serious, and immediate problems that our state faces on an annual basis" (Act 8, SSLH 2005). While the Legislature found that "it [was] the government's responsibility to resolve those issues, it [was] also the government's responsibility to keep a watchful eye on the future and guide the State in the right direction for succeeding generations" (Act 8, SSLH 2005). Thus, the Legislature believed in 2005 "that the time had come to review the precepts of the Hawaii State Plan and other fundamental components of community planning. Specifically, many quality-of-life issues, including water quality, air quality, land use, energy, and ocean resources, are important to the people of Hawaii and should focus on the planning of Hawaii's future" (Act 8, SSLH 2005).

Act 8, Special Session Laws of 2005 required the Hawaii 2050 Task Force to provide criteria or benchmarks as recommendations to either be enacted into law, adopted as policies for governmental agencies, or through guiding budgetary priorities. A report from the Hawaii 2050 Task Force was also required to provide the Legislature recommendations, including any implementing legislation prior to the 2006 legislative session. The Act also required the State Auditor to prepare the Hawaii 2050 Sustainability Plan to define and implement state goals, objectives, and priority guidelines using the Hawaii State Planning Act's §226-3 to §226-27 of the Hawaii Revised Statutes as guiding principles. The State Auditor was required to solicit input from the public and all state departments to prepare the plan and incorporate all or some of the Hawaii 2050 Task Force recommendations in the Hawaii 2050 Sustainability Plan.

The Hawaii 2050 Sustainability Plan was directed through Act 8 to serve as a guideline for funding and implementation by state and county agencies. The State Auditor submitted the *Hawaii 2050 Sustainability Plan: Charting a Course for Hawaii's Sustainable Future* to the Legislature in January 2008.[1] Finally, Act 8 further required the State Auditor, with the assistance of the Office of Planning, to update the plan every ten years and report to the Legislature.

This report seeks to evaluate the Hawaii 2050 Sustainability Plan to determine what goals, 2020 benchmarks, and strategic actions were implemented over the past ten years. Funding will be necessary to perform a formal update to the Hawaii 2050 Sustainability Plan.

[1] Hawaii 2050 Sustainability Task Force. (2008). Hawaii 2050 Sustainability Plan. Retrieved from: http://www.oahumpo.org/wp-content/uploads/2013/02/Hawaii2050_Plan_FINAL.pdf.

Overview of the Hawaii 2050 Sustainability Plan

The *Hawaii 2050 Sustainability Plan: Charting a Course for Hawaii's Sustainable Future* reviewed the Hawaii State Planning Act in Chapter 226 of the Hawaii Revised Statutes (enacted in 1978) and considered the plan to be a visionary effort of Governor George Ariyoshi that provided balanced guidance to government and the private sector in the use of our state's precious natural and cultural resources. The Hawaii 2050 Sustainability Plan, however, noted that since 1986, the Hawaii State Plan "fell into disuse. Overtime it has become outdated, and awareness of the State Plan and its goals has dwindled" (p. 7).
The Hawaii 2050 Sustainability Plan, published in 2008, noted that the last comprehensive review of the Hawaii State Plan occurred in the mid-1980s, and the functional plans were last updated in 1991.

The Hawaii 2050 Sustainability Plan created the State's first definition of sustainability, which was:

A Hawaii that achieves the following:

1) Respects the culture, character, beauty, and history of our state's island communities;

2) Strikes balance among economic, social and community, and environmental priorities; and

3) Meets the needs of the present without compromising the ability of future generations to meet their own needs. (p.1)

This definition was meant to serve as the foundation of Hawaii's sustainability toward 2050 and the beginning of a shared vocabulary about sustainability and the future of Hawaii.

5 Goals

The Hawaii 2050 Sustainability Plan identified five goals as integrated philosophies that express the sustainable future of Hawaii to reflect a sense of where Hawaii should be headed.

- **Sustainability as a Way of Life**: Living sustainably is part of our daily practice in Hawaii.
- **Sustainable Economy:** Our diversified and globally competitive economy enables us to live, work, and play in Hawaii.
- **Sustainable Environment and Natural Resources:** Our natural resources are responsibly and respectfully used, replenished, and preserved for future generations.
- **Sustainable Community and Social Well Being:** Our community is strong, healthy, vibrant and nurturing, providing safety nets for those in need.
- **Sustaining Kanaka Maoli Culture and Island Values:** Our Kanaka Maoli and island cultures and values are thriving and perpetuated.

To measure success or failure of the implementation of these five goals, the Hawaii 2050 Sustainability Plan identified 22 strategic actions and 55 indicators. This report attempts to measure these five goals based off of the Hawaii 2050 Sustainability Plan's 22 strategic actions and 55 indicators.

2020 Benchmarks

The Hawaii 2050 Sustainability Plan also identified nine priority actions to serve as intermediate steps as tangible targets or benchmarks to be achieved immediately by the year 2020. This report attempts to measure these nine "2020 benchmarks":

1. **Increase Affordable Housing Opportunities for Households up to 140% of Median Income**
2. **Strengthen Public Education**
3. **Reduce Reliance on Fossil (carbon-based) Fuels**
4. **Increase Recycling, Reuse, and Waste Reduction Strategies**
5. **Develop a More Diverse and Resilient Economy**
6. **Create a Sustainability Ethic**
7. **Increase Production and Consumption of Local Foods and Products, Particularly Agriculture**
8. **Provide Access to Long-Term and Elderly Housing**
9. **Preserve and Perpetuate our Kanaka Maoli and Island Cultural Values**

Next Steps: Recommendations for Action

Finally, the Hawaii 2050 Sustainability Plan provided four recommendations for action to implement the plan's intentions. This report attempts to evaluate the progress toward the previously established 2008 recommendations.

1. **Take Action on the Nine "2020 Benchmarks:"** to kick-start Hawaii's sustainability process.

2. **Establish a State Sustainability Council:** This non-regulatory government body would be in charge of coordinating, marketing, and implementing Hawaii 2050 initiatives and recommendations. Similar to the State's Council on Revenues, this council would help to promote sustainability, determine intermediate and long-term benchmarks, measure success, coordinate cross-sector efforts and dialogue, and report to government and private sector leaders on progress.

3. **Develop Sustainability Indicators:** The 55 Hawaii 2050 indicators would be an annual aggregation of the data as the primary measure of the overall progress of our society. These 55 indicators will measure Hawaii's overall economic, environmental, community, and cultural characteristics.

4. **Report on Progress:** To be held accountable to these goals and objectives, an annual report should be produced by the Sustainability Council and presented to government and other leaders.

Assessment of the 2008 Recommendations for Action

Recommendation 1: Focus on Priority Actions, Take Action on the Nine "2020 Benchmarks"

1. Increase Affordable Housing Opportunities for Households up to 140% of the Medium Income

In 2006, the Hawaii Housing Policy Study found that almost half of the state's rental units were not affordable for its residents.[2] In 2008, the Hawaii 2050 Sustainability Plan identified affordable housing as the most critical issue facing the state.[3] The National Low Income Housing Coalition's (NLIHC) annual report, *Out of Reach 2017*, documents the gap between wages and the price of housing across the United States.[4] The report's housing wage is an estimate of the hourly wage that a full-time worker must earn to afford a modest and safe rental home without spending more than 30% of income on rent and utility costs. Hawaii's housing wage is presently the highest in the nation at $35.20 for a two-bedroom rental unit at the Fair Market Rent (FMR) of $1,830 established by the U.S. Department of Housing and Urban Development (HUD).

140% AMI IN 2017 DOLLARS

STATEWIDE AVERAGE: $113,942
HAWAII COUNTY: $88,620
MAUI COUNTY: $103,740
KAUAI COUNTY: $110,800
HONOLULU COUNTY: $121,240

Special Action Team on Affordable Rental Housing

In order to afford this level of rent and utilities — without paying more than 30% of income on housing — a household must earn $6,102 monthly or $73,217 annually. A worker earning the state minimum wage of $9.25 per hour would need to work 3.8 full-time jobs, or approximately 152 hours per week for all 52 weeks of the year, in order to afford a two-bedroom apartment at HUD's FMR. As a point of contrast, the national housing wage is $21.21 for a two-bedroom apartment with a FMR of $1,103.[5] As the most expensive state in the nation to rent a home, the NLIHC estimates that Hawaii has a deficiency of 27,889 units for families earning 80% or less of HUD's Area Median Income (AMI).[6]

HUD defines households earning up to:

- 30% AMI as extremely low income
- 50% AMI as very low income
- 80% AMI as low income
- Up to 120% AMI as moderate income, and up to 140% AMI as above-moderate income.

[2] State of Hawaii, Hawaii Housing Finance and Development Corporation. (2006). Hawaii Housing Planning Study. Retrieved from: http://www.hawaiihousingalliance.org/docs/pubs/State,%20County,%20Legislative%20Housing%20Reports/Hawaii%20State%20Housing%20Policy%20Studies/SMS%20Hawaii%20Housing%20Policy%202006%20Technical%20Data.pdf.
[3] Hawaii 2050 Sustainability Task Force. (2008). Hawaii 2050 Sustainability Plan: Charting a Course for Hawai'i's Sustainable Future. Retrieved from: http://www.oahumpo.org/wp-content/uploads/2013/02/Hawaii2050_Plan_FINAL.pdf.
[4] National Low Income Housing Coalition. (2017). 2017 Annual Report: *Out of Reach 2017: The High Cost of Living*. Retrieved from: http://nlihc.org/sites/default/files/oor/OOR_2017.pdf.
[5] Ibid.
[6] Ibid.

The Hawaii 2050 Sustainability Plan published that the Hawaii Housing Policy Study (2006) measured 435,818 housing units in Hawaii with 54.2% [sic] (correction: 54.3%[7]) of households in 2006 paid less than 30% of income for housing, referencing that paying less than 30% of income is considered affordable. The plan also identified that 34% are cost burdened, with 11.3% of households paying 30-40% of their incomes for housing, and 22.6% paid housing payments exceeding 40% of their income. This report will use the same measurement references which includes two updates to the Hawaii Housing Policy Studies in 2006, 2011, and 2016 as reflected in Figures 1 and 2.

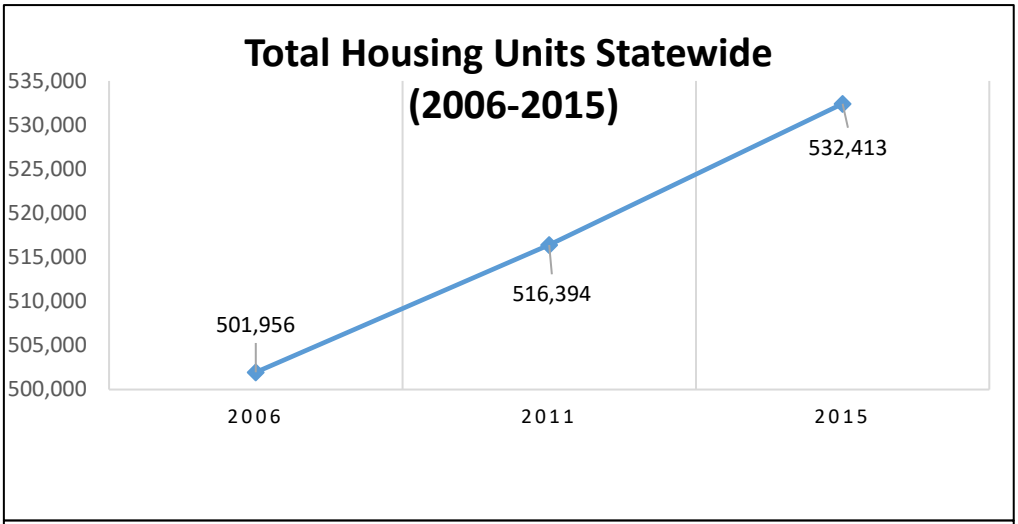

Figure 1. Total Households in Hawaii by Year 2006-2016. Data from the Hawaii Housing Planning Study, 2016 prepared for the Hawaii Housing finance and Development Corporation, 2016.

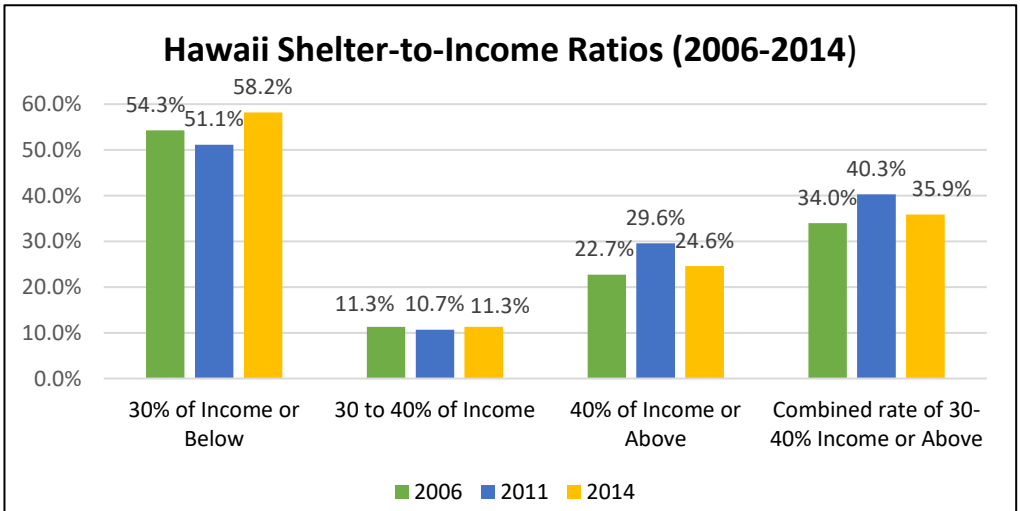

Figure 2. Hawaii Shelter-to-Income Ratios by Year 2006-2014. Data from the Hawaii Housing Planning Study, 2016 prepared for the Hawaii Housing Finance and Development Corporation, 2016.

[7] State of Hawaii, Hawaii Housing Finance and Development Corporation. (2006). Hawaii Housing Planning Study. Retrieved from: http://www.hawaiihousingalliance.org/docs/pubs/State,%20County,%20Legislative%20Housing%20Reports/Hawaii%20State%20Housing%20Policy%20Studies/SMS%20Hawaii%20Housing%20Policy%202006%20Technical%20Data.pdf.

The State of Hawaii recently enacted Act 127 in 2016 which established a Special Action Team on Affordable Rental Housing to recommend actions to increase the supply of rental housing, particularly rental housing affordable to low- and moderate-income families. This Special Action Team was also required to develop a ten year plan that identifies state, county, and private parcels of land that are suitable for housing units. Act 127 further required the update to the Hawaii State Planning Act's Housing Functional Plan, which was recently updated in February 2017. This State Housing Functional Plan (2017) based the definitions of "affordable housing" on HUD Area Median Incomes. For example, the State Housing Functional Plan makes a distinction between affordable rental housing, capped at 80% of AMI, and affordable for-sale housing, targeted to families earning between 80% and 140% of AMI.[8]

As noted in §2 of Act 127 (2016), the state will require 64,700 housing units to meet the projected housing demand between 2015 and 2025. Of these, a projected 22,247 units will be needed for rental units for households earning 80% or less of AMI.[9] These projected numbers stem from the April 2015 State Department of Economic Development and Tourism (DBEDT), *Measuring Housing Demand in Hawaii, 2015-2025* (DBEDT Housing Demand Study), which projects a statewide demand for 64,693 housing units over the ten year period of 2015-2025. Further and in-depth information on Hawaii's affordable rental housing may be found in the State's Special Action Team on Affordable Rental Housing Ten Year Plan, which will be released in 2018.

WHO NEEDS AFFORDABLE RENTAL HOUSING?

__68%__ of households earning less than $65,470 need affordable rental housing

__21%__ of households earning between $65,470 and $98,204 need housing, and they are targeted as for-sale "workforce" housing

Only __22%__ of households earning more than $98,204 need housing, and they are targeted as for-sale "workforce" or market rate housing.

Special Action Team on Affordable Rental Housing

[8] State of Hawaii, Hawaii Housing Finance and Development Corporation. (2017). State Housing Functional Plan. Retrieved from: https://dbedt.hawaii.gov/hhfdc/files/2017/03/Housing_2017.pdf.
[9] State of Hawaii, Special Action Team on Affordable Housing. (2018). Ten Year Plan and Report to the 2018 State Legislature.

2. Strengthen Public Education

In 2016, the State Department of Education (DOE) began a year-long effort to review and extend their 2012-2018 Strategic Plan. Following an extensive community outreach program, and based on feedback from thousands of participants, the 2017-2020 DOE-BOE Joint Strategic Plan (Strategic Plan) was approved by the Board of Education on December 6, 2016.[10] The Strategic Plan delineates detailed goals, objectives, and strategies aimed at improving our public education system. Centered on the Strategic Plan's first goal – student success, the Strategic Plan outlines four objectives with related strategies to ensure that all students demonstrate that they are on a path toward success in college, career, and citizenship. These objectives and strategies include:

Objective One

EMPOWERED.

All students are empowered in their learning to set and achieve their aspirations for the future

1a.

Increase student engagement and empowerment through relevant, rigorous learning opportunities that incorporate students' voices. Students are encouraged to apply their learning through life experiences, questions, and challenges. Students practice creative problem solving and can see themselves as part of a community effort to address complex questions and challenges that impact our islands and the world.

1b.

Ensure that high school graduates demonstrate the General Learner Outcomes (GLOs) and have the abilities, habits, and knowledge to set and achieve their short-term and long-term career, community, and postsecondary education goals. Students can identify the training, certificate, apprenticeship, and/or college degree requirements for their career and community passions, and are equipped with the knowledge and skills to set and achieve their goals.

1c.

Throughout their K-12 education experience, students have diverse opportunities to explore, plan, and prepare so that they graduate from high school ready to succeed. Students have access to high-quality career and college counseling, mentorship opportunities, internships and advanced courses (e.g., Early College) to support their long-term success.

Objective Two

WHOLE CHILD.

All students are safe, healthy, and supported in school, so that they can engage fully in high-quality educational opportunities.

2a.

Provide students with learning environments that are caring, safe, and supportive of high-quality learning.

2b.

Address students' physical, mental, and behavioral health through school programs and partnerships with families, community organizations, and government agencies that support students' well-being.

2c.

Cultivate a community and school culture where attendance is valued, encouraged, and supported. Extend this culture of attendance to the home; encourage families to plan for family vacations, travel, and other events during school breaks, holidays and other non-student days.

[10] State of Hawaii, Department of Education and Board of Education. (2016). Strategic Plan 2017-2020. Retrieved from: http://www.hawaiipublicschools.org/DOE%20Forms/Advancing%20Education/SP2017-20.pdf.

Objective Three

WELL-ROUNDED.

All students are offered and engage in a rigorous, well-rounded education so that students are prepared to be successful in their post-high school goals.

3a.
Provide students of all backgrounds, ages, and needs with a challenging and quality standards-based education in all subject areas.

3b.
Ensure that each student's learning is personalized, informed by high-quality data, and advances them toward readiness for success in career, college, and community.

Objective Four

PREPARED AND RESILIENT.

All students transition successfully throughout their educational experiences.

4a.
Identify and address student strengths and challenges early, so students may transition into early elementary grades ready to learn and with a cognitive foundation for reading that prepares them for the future.

4b.
Support students' transition in adolescence (grades 5-10) through school practices, counseling, and research-based experiences that advance total well-being.

4c.
Creative innovative learning options to earn a high school diploma.

4d.
Support students who are transitioning between grade levels or transferring to a new school.

4e.
Ensure that every high school graduate or completer has an identified next step after high school aligned with their future aspirations.

As the DOE begins to focus on implementation of their new Strategic Plan with an eye toward sustainable improvement in the public education system, focus has sharpened around three important areas: school design, student voice, and teacher collaboration.

In addition to the Strategic Plan, the DOE partnered over the past several years with Hawaii P-20 Partnerships for Education to track college and career readiness indicators.[11] An annual report has been produced every year since 2009. The report presents information on how well Hawaii's graduates are prepared to meet the DOE's vision of what a high school graduate should be. Indicators are based on recommendations from *Measures that Matter: Making College and Career Readiness the Mission of High Schools*, published by Achieve, a non-profit education organization created in 1996 by a bipartisan group of governors and business leaders to help states with their college and career readiness goals.[12]

Data presented in Table 1 is aggregate for the state; however, reports for individual high schools are available online.

[11] Hawaii P-20 Partnerships for Education. (2017). College and Career Readiness Indicators Reports. Retrieved from: http://www.p20hawaii.org/resources/college-and-career-readiness-indicators-reports/.

[12] Achieve and the Education Trust. (2008). Making college and Career Readiness the Mission for High Schools: A Guide for State Policymakers. Retrieved from: https://www.achieve.org/files/MakingCollegeandCareerReadinesstheMissionforHighSchool.pdf.

Table 1: DOE Statewide College and Career Readiness Indicators (2006 – 2016)

CLASS OF:	2009	2010	2011	2012	2013	2014	2015	2016
High School Completers[1]	11,451	10,787	10,805	11,596	11,275	11,216	10,927	11,003
On-time Graduation Rate[2]	80%	80%	81%	81%	82%	82%	82%	82%
Hawaii State Assessments (% Proficient)[3,4]								
Reading	60%	62%	65%	67%	67%	72%	72%	54%
Math	39%	43%	45%	49%	55%	60%	60%	30%
Science	27%	24%	N/A	27%	22%	22%	34%	30%
Advanced Placement (AP)[5]								
# (%) of completers taking AP exams	3,209 (28%)[6]	2,012 (19%)	2,298 (21%)	2,830 (24%)	3,022 (27%)	3,158 (28%)	3,268 (30%)	3,644 (33%)
# scoring ≥ 3 on at least one exam	2,068[7]	968	1,045	1,176	1,245	1,355	1,379	1,597
Dual Credit Participants[8]	478	562	607	671	723	879 (8%)	1,058 (10%)	1,573 (14%)
College Enrollment Nationwide, Fall[9]	50%	50%	53%	54%	54%	56%	56%	55%
2-year (% of completers)	27%	26%	27%	28%	26%	26%	25%	23%
4-year (% of completers)	23%	24%	26%	26%	28%	30%	31%	32%
College Enrollment, UH only, Fall # (%) of completers	4,590 (40%)	4,232 (39%)	4,384 (41%)	4,409 (38%)	4,258 (38%)	4,136 (37%)	3,956 (36%)	3,888 (35%)
Mathematics # (%) enrolled in UH								
College-level	809 (18%)	856 (20%)	883 (20%)	1,049 (24%)	1,138 (27%)	1,100 (27%)	1,058 (27%)	1,309 (34%)
Remedial or Developmental	1,725 (38%)	1,516 (36%)	1,562 (36%)	1,593 (36%)	1,342 (32%)	1,280 (31%)	1,101 (28%)	899 (23%)[10]
"Other"[11]	N/A	243 (6%)	249 (6%)	189 (4%)	209 (5%)	148 (4%)	130 (3%)	N/A
Not Enrolled	N/A	1,617 (38%)	1,641 (37%)	1,531 (35%)	1,516 (35%)	1,422 (34%)	1,469 (37%)	1,423 (37%)
English # (%) enrolled in UH								
College-level	1,603 (35%)	1,532 (36%)	1,686 (38%)	1,833 (42%)	1,728 (41%)	1,754 (42%)	1,670 (42%)	1,870 (48%)
Remedial or Developmental	1,583 (35%)	1,526 (36%)	1,507 (34%)	1,357 (31%)	1,311 (31%)	1,221 (30%)	976 (25%)	735 (19%)[10]
"Other"[11]	N/A	79 (2%)	70 (2%)	61 (1%)	52 (1%)	35 (1%)	39 (1%)	N/A
Not Enrolled	N/A	1,095 (26%)	968 (22%)	946 (21%)	979 (23%)	849 (21%)	937 (24%)	840 (22%)

[1] For these reports, high school completers include those who have earned diplomas or certificates of completion.
[2] On-time graduation rate is based on the first-time ninth grade cohort adjusted for students who transferred in or out.
[3] Hawaii State Assessment (HSA) proficiencies are based on each graduating class's 10th grade scores.
[4] 2016 percentages reflect performance on the Smarter Balanced Assessment, which replaced the HSA.
[5] Advanced Placement results are reported for high school completers who took at least one Advanced Placement exam during high school.
[6] For 2009, number and percentage of students taking AP exams.
[7] For 2009, number of exams scored 3 of 5 or better.
[8] Dual Credit participants are high school completers who took at least one credit course from the University of Hawaii while they were still enrolled in high school. Numbers reported for 2009 and 2010 reflect only participants in the Running Start program. These participants are high school completers who took at least one Running Start course during high school.
[9] These data represent high school completers' confirmed college enrollment following high school graduation and are based on reports provided by the National Student Clearinghouse.
[10] These figures represent enrollment in any course that is below college-level.
[11] "Other" courses satisfy UH general education mathematics or English requirements and/or may be used to fulfill a "terminal" mathematics or English requirement for a degree or certificate.

Source: Hawaii Department of Education, data compiled from Hawaii P-20 Partnerships for Education Reports.

The Hawaii 2050 Sustainability Plan specifically identified scores on the National Assessment of Educational Progress (NAEP) as a metric to measure progress toward the strengthening of public education. This metric alone, however, does not provide a complete picture of the actions that have been taken over the past ten years to strengthen public education in the state. NAEP was originally designed to provide a common national measure of student performance during a time in which there was no consistency in state academic standards. Results are based on samples of fourth- and eighth-graders, meaning that not all students across the state are tested.

Table 2 provides the original 2007 benchmark and the identified 2019 goal for percentage proficiency in grade 4 and grade 8 reading and mathematics from the Hawaii 2050 Sustainability Plan. There appears to be no indication as to how the 2019 goals were set in the 2008 Hawaii 2050 Sustainability Plan. Since NAEP also assesses science in grades 4 and 8, such data were included where available. Accordingly, in addition to NAEP scores, the DOE offers the following data in Table 3 to demonstrate progress made toward strengthening public education.

Table 2: Percentage of Students Proficient and Advanced on the National Assessment of Educational Progress (NAEP)

	2007 Benchmark	Sustainability Plan 2019 Goal	2011	2013	2015
Reading					
Grade 4	26%	**35%**	27%	30%	29%
Grade 8	20%	**22%**	26%	28%	26%
Mathematics					
Grade 4	33%	**61%**	40%	46%	38%
Grade 8	21%	**31%**	30%	32%	30%
Science					
Grade 4	--	--			30%
Grade 8	--	--	22%		23%
Source: Hawaii State Department of Education (Accountability Section, Assessment and Accountability Branch – Office of Strategy, Innovation and Performance)					

Table 3: Hawaii Statewide Assessment Program, Percentage Proficient (2013 – 2016)

	2013-2014	2014-2015	2015-2016
Reading/ELA*	69%	49%	51%
Mathematics*	58%	41%	42%
Science**	40%	42%	43%
Notes: Achievement rates are based on all students enrolled on the Participation Rate Count date. **Hawaii State Reading and Mathematics Bridge Assessments were administered students in grades 3-8 and 10. These Bridge Assessments were meant to bridge between the Hawaii State Assessment and the Smarter Balanced Assessment, which is based on Common Core State Standards. The Smarter Balanced Assessment have been administered for English Language Arts/Literacy and Mathematics to students in grades 3-8 and 11 beginning with SY2014-2015.* ***Science proficiency has been measured by the HAS Science for grades 4 and 8 and the Biology I End-of-Course Exam and the Hawaii State Alternate Assessment for high school.*			
Source: Hawaii State Department of Education (Accountability Section, Assessment and Accountability Branch – Office of Strategy, Innovation and Performance)			

Hawaii's Blueprint for Public Education

The Federal Government reauthorized the Every Student Succeeds Act (ESSA) in 2015, a new federal education law replacing the No Child Behind Act, which must be implemented by the 2017-2018 school year. Using the Department of Education's six year Strategic Plan, the State developed a new Hawaii Blueprint for Public Education to guide preparation of the State of Hawaii's ESSA plan. This Hawaii Blueprint for Public Education is organized around three focus areas—student success, educator success, and system success. Each focus area provides design principles to be student centered and based on a theory of action that inspires engagement rather than compliance.[13]

[13] State of Hawaii, Department of Education. (2017). Every Student Succeeds Act. Retrieved from: http://www.hawaiipublicschools.org/VisionForSuccess/AdvancingEducation/StriveHIPerformanceSystem/Pages/ESSA.aspx.

3. Reduce Reliance on Fossil Fuels

State Greenhouse Gas Emission Reduction Goals

The State of Hawaii enacted Act 234, codified as Chapter 342B-Part VI of the Hawaii Revised Statutes, in 2007 to establish the State's policy framework and requirements to address greenhouse gas (GHG) emissions.[14] Act 234 (2007) likewise established the Greenhouse Gas Emissions Reduction Task Force within the State's Department of Business Economic Development and Tourism (DBEDT) to submit a work plan and proposed regulatory scheme to the Legislature prior to the 2010 Legislative Session.[15] Hawaii's Greenhouse Gas Emissions law aims to achieve cost-effective GHG emission reductions to achieve emission levels at or below Hawaii's 1990 GHG emissions by January 1, 2020 (which would be 13.66 million metric tons per year of CO_2e, excluding aviation and international bunker fuel emissions and includes carbon sinks).[16] In 2008, the State of Hawaii developed statewide GHG emission inventories for 1990 and 2007.[17] This law was the product of many reports from the previous decade warning of the risks of climate change, the need to reduce GHG emissions and the need for Hawaii's energy independence, including the *Inventory of Hawaii Greenhouse Gas Emissions Estimates for 1990*,[18] and the *Hawaii Energy Strategy 2000.*[19] The task force was dissolved following its legislative report in 2010.[20] The report highlighted that the task force unanimously recommended strong support and implementation of the Hawaii Clean Energy Initiative (HCEI) with the support of additional policies and funding as a means to achieve energy security and reducing GHG emissions.

Act 234 (2007) tasks the State's Department of Health's Clean Air Branch with establishing GHG emission limits to be achieved by January 1, 2020, establishing emission reduction; and report and verify statewide GHG emissions and to monitor and enforce compliance. By June 2014 the Department of Health's Clean Air Branch updated the Hawaii Administrative Rules and initiated GHG emission rules and emissions caps to implement the goals set forth in Act 234 (2007) through HAR Chapter 11-60.1.[21] These Hawaii Administrative Rules (HAR Chapter 11-60.1-204k) further requires that the DOH must conduct annual evaluations to determine progress in achieving the statewide GHG emissions limit.[22]

The Department of Health's Clean Air Branch is in the process of updating prior statewide GHG inventories through an annual report expected to be released in 2018, which will include a new 2015 statewide GHG emission inventory, updated 1990, 2007, and 2010 GHG inventories, as well as statewide GHG projections for 2020 and 2025. At the 9th Annual Hawaii Clean Energy Day in August 2017, the Clean Air Branch shared the following updated data from previous GHG inventories from their updated report depicted in Figure 3.[23]

[14] Hawaii Revised Statutes Chapter 342B-Part VI.
[15] State of Hawaii, Department of Business Economic Development and Tourism, Greenhouse Gas Emissions Reduction Task Force. (2009). Report to the 2010 Legislature: *Work Plan for Greenhouse Gas Emissions Reductions*. Retrieved from: http://files.hawaii.gov/dbedt/annuals/2015/2015-greenhouse-gas-program.pdf.
[16] State of Hawaii, Department of Health, Clean Air Branch. (2013). Highlights for State Greenhouse Gas (GHG) Rules. Retrieved from: http://health.hawaii.gov/cab/files/2013/10/Highlights__post-comment-period.pdf.
[17] State of Hawaii, Department of Business Economic Development and Tourism; Energy, Resources, and Technology Division, and Department of Health, Clean Air Branch. (1997). Inventory of Hawaii Greenhouse Gas Emissions Estimates for 1990.
[18] Ibid.
[19] State of Hawaii, Department of Business Economic Development and Tourism, Energy Resources and Technology Division. (2000). Hawaii Energy Strategy 2000. Retrieved from: http://www.hawaiicleanenergyinitiative.org/storage/hes2000.pdf.
[20] State of Hawaii, Hawaii Department of Business Economic Development and Tourism, Greenhouse Gas Emissions Reduction Task Force. (2009). Report to the 2010 Legislature: *Work Plan for Greenhouse Gas Emissions Reductions*. Retrieved from: http://files.hawaii.gov/dbedt/annuals/2015/2015-greenhouse-gas-program.pdf.
[21] State of Hawaii Administrative Rules. (2014). Hawaii Administrative Rules Chapter 11-60.1. Retrieved from: http://health.hawaii.gov/cab/files/2014/07/Highlights-GHG-RulesFinal.pdf.
[22] Ibid.
[23] State of Hawaii, Department of Health, Clean Air Branch. (2017). 9th Annual Hawaii Clean Energy Day, GHG Rules & Statewide GHG Emission Inventories Presentation. Retrieved from: https://health.hawaii.gov/epo/files/2017/10/HawaiiCleanEnergyDay2017final.pptx.

Further information about the Department of Health's updated GHG emissions annual report is available at the Clean Air Branch's website: http://health.hawaii.gov/epo/strategic/greenhouse/.

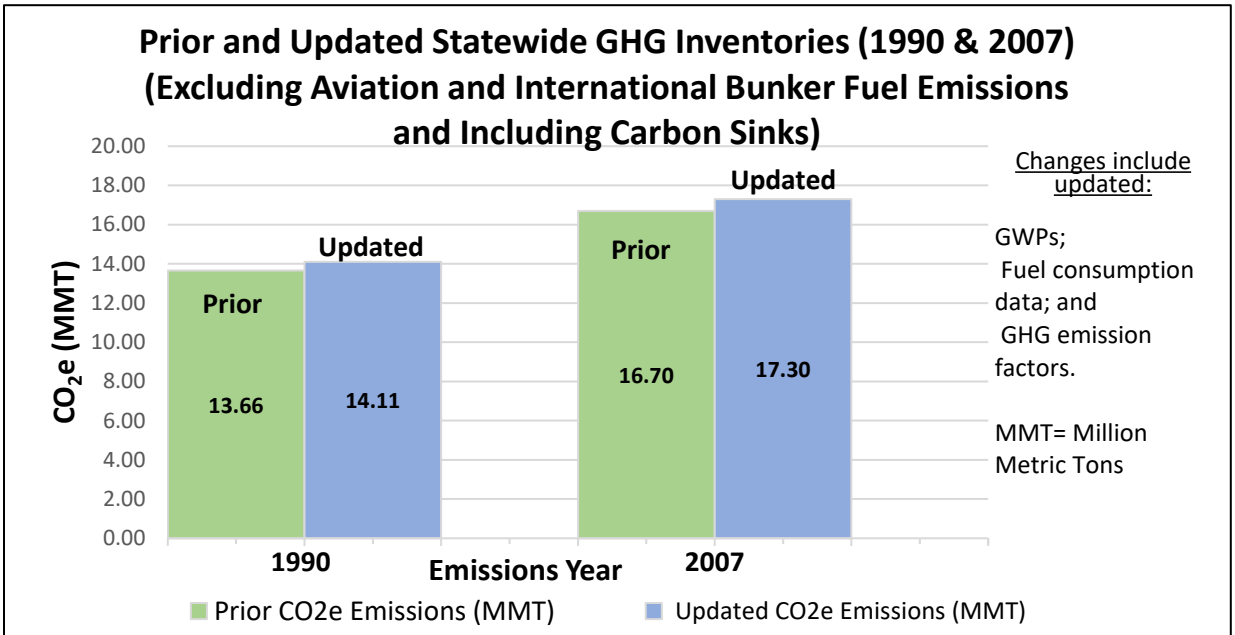

Figure 3. Prior and Updated Statewide GHG Inventories (1990 & 2007) (Excluding Aviation and International Bunker Fuel Emissions and Including Carbon Sinks).
Source: Hawaii State Department of Health, Clean Air Branch.

Hawaii's Commitment to the UN Paris Agreement

The State enacted Act 32 (SB 559) in 2017, codified as Chapter 225P of the Hawaii Revised Statutes, which documented the State of Hawaii's commitment to combat climate change by systematically reducing GHG emissions and improving Hawaii's resiliency to climate change; the State's commitment aligned with the principles and contributed to the goals set by the Paris Agreement.[24] The Paris Agreement was the 21st Conference of the parties of the United Nations Framework Convention on Climate Change which adopted an agreement in 2016 to address worldwide GHG emissions mitigation, adaptation, and finance starting in the year 2020. Under the Paris Agreement adopted in 2016, 195 countries signed as parties to set GHG reduction goals, record and communicate information through a transparency mechanism, and provide support to undeveloped countries through a finance mechanism.

The recent passage of this law made the State of Hawaii the first state in the United States to align with the Paris Agreement. Act 32 further requires that the:

> State shall expand strategies and mechanisms to reduce the GHG emissions statewide through the reduction of energy use, adoption of renewable energy, and control of air pollution among all agencies, departments, industries, and sectors, including transportation. These strategies and mechanisms shall utilize the best available science, technologies, and policies to reduce GHG emissions and shall be closely aligned with the climate change principles and goals adopted in the Paris Agreement and Hawaii's share of obligations within the expectations apportioned to the United States in the Paris Agreement, regardless of federal action. The State is also required to strive to formulate and communicate long-term low GHG emission development strategies and shall take actions to conserve and enhance long-term sinks and reservoirs of GHGs, by prioritizing the development of parks, greenways, and restoration of native upland and coastal forests and wetlands. (Act 32, Session Laws of Hawaii 2017)

[24] Hawaii Revised Statutes §225P-3. (L 2014, c 83, pt of §2; am L 2017, c 32, §5).

Hawaii's Carbon Farming Task Force

To assist with the enhancement of long-term sinks and reservoirs of GHGs, Act 33 was also enacted in 2017 creating a Carbon Farming Task Force within the Office of Planning to identify practices in agriculture, aquaculture, and agroforestry to improve soil health, and promote carbon sequestration – the capture and long-term storage of atmospheric carbon dioxide to mitigate climate change. The Carbon Farming Task Force is required to provide a final report of its findings and recommendations by 2025.[25]

Hawaii Clean Energy Initiative

The State of Hawaii launched the Hawaii Clean Energy Initiative (HCEI) partnership in 2008 through a memorandum of understanding with the U.S. Department of Energy to collaborate on the reduction of Hawaii's heavy dependence on imported fossil fuels and established a goal of achieving 70% clean energy by 2030 through renewable energy and energy efficiency.[26] Since its establishment, over the past ten years, the HCEI is now a framework of statutes and regulations supported by a diverse group of stakeholders including business leaders, policy makers, and concerned citizens committed to Hawaii's clean energy future. In support of this 70% clean energy goal, the State established a renewable portfolio standard (RPS) of 40% by 2030, and an energy efficiency portfolio standard (EEPS) of 30% by 2030.[27]

The HCEI grew stronger since its creation, most notably it reaffirmed its commitment by renewing its Memorandum of Understanding with the U.S. Department of Energy in 2014 to set bold new clean energy goals, including[28]:

- Achieving a statewide 100% renewable portfolio standards (RPS) by the year 2045.
- Reducing electricity consumption by 4,300 gigawatt-hours by the year 2030, which would continue to be enough electricity to power every home in Oahu, Molokai, Lanai, Maui, and Hawaii Island for more than two years.
- Reducing petroleum use in Hawaii's transportation sector which includes two-thirds of the State's overall energy use.

The Hawaii Clean Energy Initiative (HCEI) credits a total of 82 laws enacted between 2008 and 2017 as key policy milestones and a framework of policies guiding Hawaii's energy transformation.[29] These policies range from renewable energy portfolio and energy efficiency targets, which are codified into law, as well as regulatory reform policies, tax policies, and clean energy financing policies. The HCEI program was likewise established by law in 2010 through Act 73, Hawaii's Environmental Response, Energy, and Food Security Tax ("the Barrel Tax"), which temporarily created three special funds—the Energy Security Special Fund, the Energy Systems Special Fund, and the Agricultural Development and Food Security Fund.[30] Act 73 also was partially codified as §196-10.5 of the Hawaii Revised Statutes to provide support for the Hawaii Clean Energy Initiative, the Greenhouse Gas Emissions Reduction Task Force, and the Hawaii Natural Energy Institute to advance the State's energy goals.[31]

[25] State of Hawaii Office of Planning. (2017). Carbon Farming Task Force. Retrieved from: http://planning.hawaii.gov/carbon-farming-task-force/.
[26] State of Hawaii. (2017). Hawaii Clean Energy Initiative. Retrieved from: http://www.hawaiicleanenergyinitiative.org/about-the-hawaii-clean-energy-initiative/.
[27] U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy. (2017). Achieving 70% Clean Energy by 2030 in Hawaii. Retrieved from: https://energy.gov/eere/technology-to-market/achieving-70-clean-energy-2030-hawaii.
[28] State of Hawaii. (2017 Feb). Transforming Power in Paradise: The Hawaii Clean Energy Initiative. Retrieved from: http://www.hawaiicleanenergyinitiative.org/wp-content/uploads/2015/02/HCEI_FactSheet_Feb2017.pdf.
[29] U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy. (2017). Achieving 70% Clean Energy by 2030 in Hawaii. Retrieved from: https://energy.gov/eere/technology-to-market/achieving-70-clean-energy-2030-hawaii.
[30] Hawaii Clean Energy Initiative Program Act. (2010). Hawaii Revised Statutes §196-10.5.
[31] University of Hawaii Economic Research Organization. (2014). Hawaii's Environmental Response, Energy, and Food Security Tax Credit (aka Barrel Tax). Retrieved from: http://www.uhero.hawaii.edu/news/view/269.

State Renewable Portfolio Standard Goals

The Hawaii State Energy Office provides an overview of Hawaii's progress toward its renewable energy goals. In 2001, the State enacted Act 272 codified as §269-92 of the Hawaii Revised Statutes establishing the State's renewable portfolio standard (RPS). Since the law's enactment, Hawaii's RPS requirements grew along with the innovation of renewable energy technologies; the law requires each electric utility in the State of Hawaii to establish a renewable portfolio standard of [32]:

- **10% RPS by 2010**
- **15% RPS by 2015**
- **30% RPS by 2020**
- **40% RPS by 2030**
- **70% RPS by 2040**
- **100% RPS by 2045**

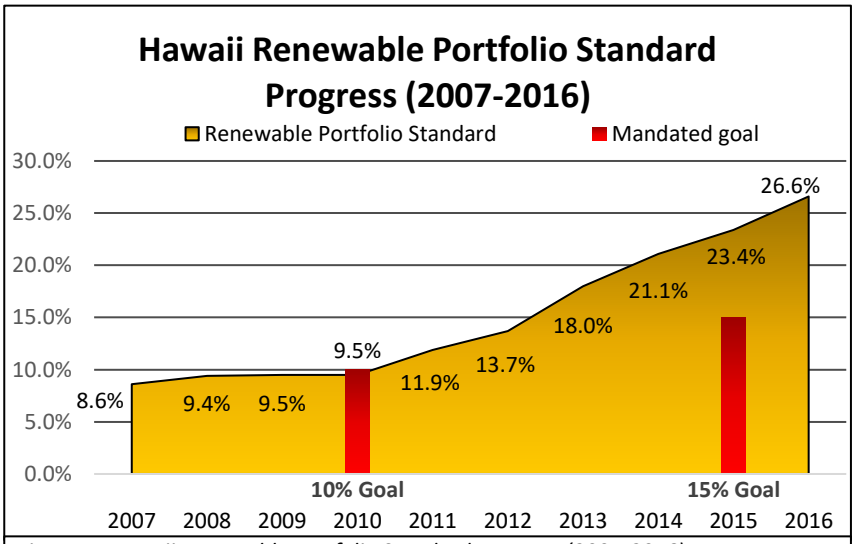

Figure 4. Hawaii Renewable Portfolio Standard Progress (2007-2016).
Sources: Hawaii Renewable Portfolio Standards Act, Hawaii State Energy Office

Hawaii's RPS grew significantly over the past decade as depicted in Figure 4. Hawaii's most recent RPS milestone was to achieve a 15% RPS by 2015, that year Hawaii's renewable portfolio measured at 23.4%, 8% above the 2015 goal and on track toward the goal to have a 30% renewable portfolio standard by the year 2020.

State Energy-Efficiency Portfolio Standard Goals

Hawaii's energy-efficiency portfolio standard (EEPS) was enacted in 2009 by Act 155, codified as §269-96 of the Hawaii Revised Statutes. Similar to the renewable portfolio standard, the energy-efficiency portfolio standard mandated a goal to reduce the statewide consumption of electricity by 4,300 giga-watt hours of electrical use by the year 2030. This energy-efficiency portfolio standard law designates the State's Public Utilities Commission to be responsible for establishing standards that will maximize cost-effective energy-efficiency programs and technologies as well as establish interim goals for electricity use reduction to be achieved by 2015, 2020, and 2025.[33] According to a recent *State of Hawaii Energy Efficiency Potential Study*, published in 2014, the Hawaii Public Utilities Commission set forth the following goals to achieve[34]:

- **1,375 giga-watts of energy efficiency savings by 2015**
- **2,350 giga-watts of energy efficiency savings by 2020**
- **3,325 giga-watts of energy efficiency savings by 2025**
- **4,300 giga-watts of energy efficiency savings by 2030** (*as required by HRS §269-96*)

[32] Hawaii Renewable Portfolio Standards Act. (2001). Hawaii Revised Statutes §269-92 (L 2001, c 272, §3; am L 2004, c 95, §5; am L 2006, c 162, §5; am L 2009, c 155, §3; am L 2015, c 97, §2).
[33] Energy-Efficiency Portfolio Standards Act. (2009). HRS §269-96.
[34] State of Hawaii, Public Utilities Commission. (2014). State of Hawaii Energy Efficiency Potential Study. Retrieved from: http://puc.hawaii.gov/wp-content/uploads/2013/04/State_of_HI_Potential_Study_Final.pdf.

Clean Energy within the Department of Education

The State Department of Education (DOE) launched a five year sustainability initiative in 2014, known as Ka Hei, to integrate innovative energy technology with meaningful learning experiences, all while reducing energy costs.[35] As a comprehensive energy and sustainability program, Ka Hei is at the core of DOE's sustainability efforts. Key objectives of the Ka Hei program include:

1. Reduce the cost and consumption of energy at all DOE public schools.
2. Build a diverse portfolio of new, clean, on-site energy generation.
3. Aggressively implement energy efficiency and conservation measures, including demand response.
4. Support the goals of the Hawaii Clean Energy Initiative and the DOE's goal of 90 percent clean energy by 2040.[36]
5. Leveraging these activities to create educational opportunities and stimulate the economy through local construction labor.

The Ka Hei Program supports the DOE's sustainability goals, which are outlined in Board of Education (BOE) Policy 301-9, Sustainability [37]:

> The Department of Education ("Department") has a fundamental responsibility to educate students about sustainability and to model sustainability. The Department shall establish regulations or guidelines to implement this policy. The regulations or guidelines shall include, but shall not be limited to:
>
> (1) establishing standards for facilities that ensure schools and Department facilities are designed and operated in a manner that maximizes Hawaii's natural environment and ensures the lowest environmental impact possible;
>
> (2) incorporating energy efficiency and conservation measures whenever possible;
>
> (3) reducing water consumption across facilities and utilizing grey water/storm water when possible;
>
> (4) utilizing on-site renewable energy and adopting a series of clean energy goals that guides DOE to 90% Clean Energy by 2040:
>
> 25% clean energy by 2015
> 40% clean energy by 2020
> 80% clean energy by 2030
> 90% clean energy by 2040
>
> (5) promoting the longevity and responsible procurement of facilities, equipment and vehicles;
>
> (6) promoting material conservation and recycling across facilities;
>
> (7) incorporating the importance of sustainability and environmental stewardship at the classroom level;
>
> (8) conveying the mission of sustainability and environmental stewardship at the faculty and staff level;
>
> (9) working with local partners to collaborate on projects, as well as informing the public on the efforts being made by the Department; and
>
> (10) developing and implementing a plan for measuring implementation of the sustainability policy.

[35] State of Hawaii, Board of Education. (2015). Board of Education Policy 301-9. Retrieved from: http://boe.hawaii.gov/policies/Board%20Policies/Sustainability.pdf .
[36] Ibid.
[37] State of Hawaii, Board of Education. (2017). Sustainability Policy. Retrieved from:http://boe.hawaii.gov/policies/6000series/Pages/6710.aspx.

In addition to the goals set forth in the BOE policy on sustainability, the Hawaii State Legislature passed the Sustainable Schools Initiative as Act 176 in 2016, codified as §302A-1510 of the Hawaii Revised Statutes, which requires the DOE to establish a goal of becoming net-zero with respect to energy use by January 1, 2035.[38] The Sustainable Schools Initiative sets the amount and value of energy consumed by the DOE across all public school facilities during the 2015-2016 fiscal year as the benchmark for measuring progress toward this goal and requires annual progress reporting to the Legislature.

The DOE submitted its first Sustainable Schools Initiative report to the 2017 Legislature.[39] The report explains how the Ka Hei program, in response to the termination of the Net-Energy Metering Program, began to focus efforts on submitting Photovoltaic net energy metering interconnection approvals to Hawaiian Electric. Simultaneously, the program also began to audit and install energy conservation measures at a number of schools on both Oahu and statewide as depicted in Tables 4 and 5.

Table 4: LED Lighting Projects in DOE Schools Statewide (2017)

NO. OF SCHOOLS	LED LIGHTING PROJECTS
31	Schools with LED lighting replacements completed
3	Schools with stadium LED lighting completed
2	Sustainable cooling model completed
102	Completed lighting audits
108	Examined for interior and exterior LED lighting
29	Commencing construction of exterior LED lighting
5	Commencing construction of stadium LED lighting
3	Sustainable cooling model in development or construction

Source: Department of Education, 2017

Table 5: Description of Net-Energy Metered (NEM) PV Systems and KWh Production (2017)

NEM PV Systems in Service	
16	Number of school sites
18	Number of PV systems
2,006	Subtotal of kWdc of installed PV systems
1,328,919	Subtotal of kWh of renewable energy produced as of January 24, 2017
NEM PV Systems to Complete Construction Before June 30, 2017	
58	Number of school sites
63	Number of PV systems
7,289	Subtotal kWdc of PV being installed
9,830,000	Subtotal projected kWh of renewable energy produced in one calendar year after construction completion
Total NEM PV Systems	
74	Number of school sites
81	Number of PV systems
9,295	Total kWdc of PV being installed

Source: Department of Education, 2017

[38] Hawaii Sustainable Schools Initiative, Act 176, Session Laws of Hawaii 2016. (2016). Hawaii Revised Statutes §302A-1510. Retrieved from: https://www.capitol.hawaii.gov/hrscurrent/Vol05_Ch0261-0319/HRS0302A/HRS_0302A-1510.htm.

[39] State of Hawaii, Department of Education. (2016). Report to the 2017 Legislature. Pursuant to Act 176 (2016). Retrieved from: http://www.hawaiipublicschools.org/Reports/LEG16_Energy.pdf.

Heat Abatement within the Department of Education

In 2016, Act 47, Session Laws of Hawaii 2016, was enacted and appropriated $100 million to fund capital improvement program equipment and installation costs for air conditioning, other heat abatement measures, energy efficient lighting, and other energy efficiency measures at public school campuses.[40]

The DOE opted to use several different approaches to cool schools through both mechanical and passive means.[41] These methods include:

(1) Solar-powered ventilators.
These are vents, installed either on roofs or high up on walls or windows that enable hot air to be vented out of classrooms allowing cooler air to come in. These solar-powered ventilators have been installed at the following schools:

- Hokulani Elementary
- Jarrett Middle
- Kailua Intermediate (kitchen)
- Kaiulani Elementary
- Kamiloiki Elementary (solar wall vents)
- Lunalilo Elementary (solar wall vents)
- Molokai High
- Noelani Elementary
- Niu Valley Elementary (shop building)
- Washington Middle

(2) Photovoltaic air conditioning.
The DOE piloted an air conditioning project to cool a portable at Waianae High School. The unit is powered by photovoltaics. This allows the unit to generate its own electricity. Two more photovoltaic air conditioning systems funded through a crowd-funding program led by high school students, was installed on portables at Campbell High School.

(3) Solar light.
High efficiency skylights allow light into the classroom without the heat generated by electric lights. These eliminate, in some cases, the need for turning on classroom lights throughout the entire day. Solar lights were installed at Kaimuki High (including the portables), Ewa Makai Middle, and Hookele Elementary.

(4) Increased insulation.
Since 2005, the DOE facilities team has increased insulation in roofs and walls to reduce the amount of heat gain in DOE buildings. These improvements are done in conjunction with needed repairs.

(5) Roof coating system.
By painting roofs with a heat reflective roof coating system, it is possible to reduce interior temperatures by as much as 5 degrees. This system includes solar reflective properties. Sometimes, additional layers of insulation material reduce heat transferring into the classroom and minimize the impact of direct sunlight.

[40] Act 47, Session Laws of Hawaii. (2016). Retrieved from: http://www.capitol.hawaii.gov/session2016/bills/SB3126_CD1_.pdf.
[41] State of Hawaii, Department of Education. (2017). Heat Abatement Program at Public Schools. Retrieved from: http://www.hawaiipublicschools.org/ConnectWithUs/Organization/SchoolFacilities/Pages/Heat-Abatement.aspx.

(6) Ceiling fan installation.

As part of a Race to the Top-funded facilities effort in the "Zones of School Innovation," ceiling fan installation targeted classrooms that were not already air conditioned, did not already have ceiling fans, and were used for student instruction. These classrooms are located at the following schools:

Leeward Oahu District:

- Nanakuli Elementary (8 classrooms)
- Nanakuli High & Intermediate (41 classrooms)
- Waianae Elementary (2 classrooms)
- Waianae Intermediate (42 classrooms)
- Waianae High (57 classrooms)
- Makaha Elementary (43 classrooms)
- Leihoku Elementary (5 classrooms)
- Kamaile Charter School (29 classrooms)

Hawaii Island:

- Ka'u High & Elementary (7 classrooms)
- Keonepoko Elementary (20 classrooms)
- Pahoa Elementary (37 classrooms)
- Keaau Middle (16 classrooms)
- Pahoa High & Intermediate (59 classrooms)
- Mountain View Elementary (14 classrooms)
- Naalehu Elementary (21 classrooms)

Clean Biofuel Energy Powering State's Daniel K. Inouye International Airport

Finally, the State Department of Transportation Airports Division and the Hawaiian Electric Company partnered to launch their dual-operating emergency power facility at the Daniel K. Inouye International Airport in 2017.[42] The facility, which uses four generators running on biofuels to provide up to ten-megawatts of power, was built by and is owned by the State of Hawaii. During non-emergencies, the facility is operated by Hawaiian Electric Company to provide electricity to Honolulu's grid. The power plant was designed to withstand a Category 5 hurricane and a 2,500-year recurrence earthquake.

[42] State of Hawaii, Department of Transportation. (2017). Daniel K. Inouye International Airport Emergency Power Facility in Full Operation. [Blog post]. http://hidot.hawaii.gov/blog/2017/06/29/daniel-k-inouye-international-airport-emergency-power-facility-in-full-operation/.

4. Increase Recycling, Reuse, and Waste Reduction Strategies

The State of Hawaii has a made many commitments to improve recycling for Hawaii's sustainable future. Since the early 1990's, the State passed many recycling laws and goals, including:

HRS §342G-2: Solid Waste Management Priorities/"Hawaii Integrated Solid Waste Management Act": Requires the State's Department of Health's Office of Solid Waste Management and the counties to consider solid waste management practices and processing methods in the following order of priority [43]:

1. Source Reduction
2. Recycling and bioconversion, including composting
3. Landfilling and incineration

The State Department of Health's Office of Solid Waste Management notes that the first two practices (source reduction and recycling, bioconversion, and composting, respectively) reduce the amount of waste to be either landfilled or incinerated.[44]

HRS §103D-1005: Encouraging the use of Recycled Products through the Hawaii Public Procurement Code: Requires that contracts shall be awarded to the lowest responsible and responsive bidder with preference being given to the products containing recycled material.[45]

HRS §342G-41: Goals for Recycled Product Procurement:
Establishes the policy for all state and county public agencies to give preference to the purchase of products made from recycled materials, that are themselves recyclable, and that are designed for durability.[46]

HRS §342G-43: Reporting:
Each state agency that conducts its own procurement activities shall annually submit information and data to the DOH-Office of Solid Waste Management regarding [47]:

- The agency's progress in developing procurement programs;
- The total amount of paper purchased during the year;
- The amount of recycled goods purchased during the year compared to non-recycled counterparts.

If an agency is unable to supply this information, the agency shall describe what steps it is taking to obtain this information in the future.

(b) At the request of the DOH-Office of Solid Waste Management, each county shall provide a similar report.

[43] Hawaii Revised Statutes §342G-2. (1991). Solid Waste Management Priorities. Retrieved from: https://www.capitol.hawaii.gov/hrscurrent/Vol06_Ch0321-0344/HRS0342G/HRS_0342G-0002.htm.
[44] State of Hawaii, Department of Health, Office of Solid Waste Management. (2015). 2016 Annual Report to the Legislature. Retrieved from: https://health.hawaii.gov/shwb/files/2013/06/2016_OSWM_Annual_Report.pdf.
[45] Hawaii Revised Statutes §103D-1005. (1994). Recycled Products. (L 1994, c 186, pt of §1; am L 1997, c 352, §23). Retrieved from: https://www.capitol.hawaii.gov/hrscurrent/Vol02_Ch0046-0115/HRS0103D/HRS_0103D-1005.htm.
[46] Hawaii Revised Statutes §342G-41. (1991).Goals for Recycled Product Procurement. Retrieved from: https://www.capitol.hawaii.gov/hrscurrent/Vol06_Ch0321-0344/HRS0342G/HRS_0342G-0041.htm.
[47] Hawaii Revised Statutes §342G-43. (1991). Reporting. Retrieved from: https://www.capitol.hawaii.gov/hrscurrent/Vol06_Ch0321-0344/HRS0342G/HRS_0342G-0043.htm.

HRS §342G-45: Establishment of an Office Paper and Other Materials Recovery Program:
By June 30, 1993, all state and county agencies shall establish an office paper and other materials recovery program.[48]

HRS §342G-3: Recycling Goals:
Establishes a statewide goal to reduce the solid waste stream prior to disposal by [49]:

- 25% by January 1, 1995,
- 50% by January 1, 2000 through source reduction, recycling, and bioconversion,
- 25% of the amount of office paper generated by all state and county agencies will be reduced by January 1, 1995 through source reduction. The base year for calculating progress toward this goal shall be total office paper consumption by state and county agencies in 1990.

The State Department of Health's Office of Solid Waste Management provides annual reports to the Legislature measuring the State's progress toward achieving the recycling and waste reduction goal. In their annual reports, the Office of Solid Waste Management calculates the amount of waste diversion performed by the counties. For their measurement, "diversion" refers to the combination of reuse and recycling activities; it does not include landfilling, incineration, or waste to energy processes. This diversion rate comprises recycling activity and a small amount of reuse activity of each county's tonnage of waste diverted.

According to these annual reports of Hawaii's diversion rate. Hawaii has not yet met its goal to reduce the solid waste stream by 50% by January 1, 2000. The most recent annual report from the State Department of Health's Office of Solid Waste Management indicates that the state achieved its highest diversion rate of 43% in 2015 over the previous decade. These diversion percentages were compiled from the State Department of Health's Office of Solid Waste Management annual reports spanning from 2005 to 2016 and are depicted through Figure 5.

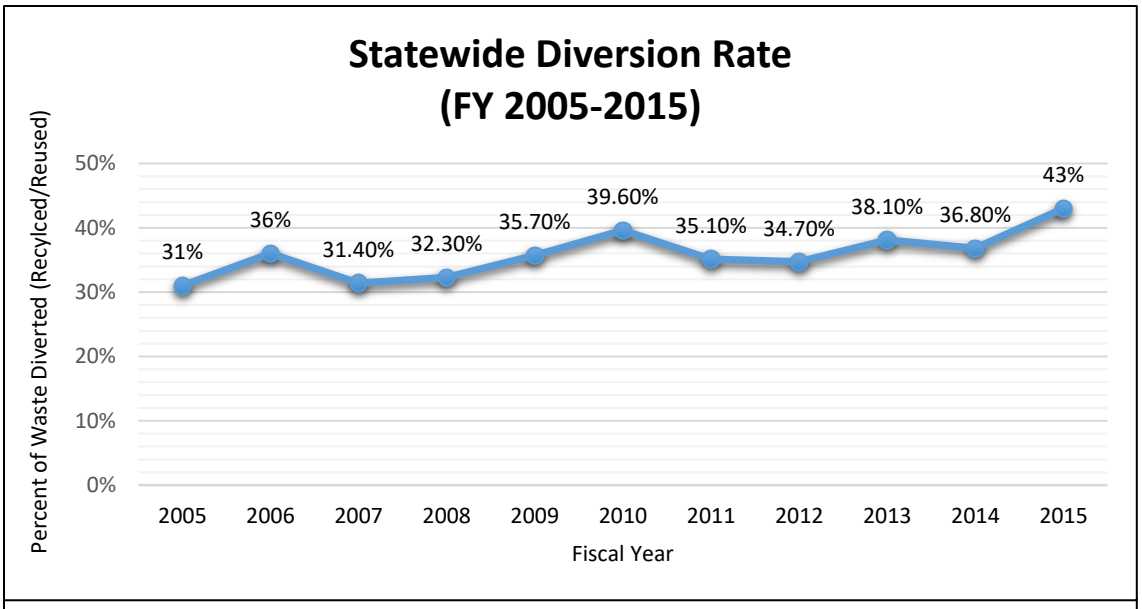

Figure 5. Statewide Diversion Rate (FY 2005-2015).
Compiled from Hawaii State Department of Health Office of Solid Waste Management Annual Reports between 2005 and 2016.

[48] Hawaii Revised Statutes §342G-45. (1991). Establishment of an Office Paper and Other Materials Recycling Program. Retrieved from: https://www.capitol.hawaii.gov/hrscurrent/Vol06_Ch0321-0344/HRS0342G/HRS_0342G-0043.htm.
[49] Hawaii Revised Statutes §342G-3. (1991). Goals. Retrieved from: https://www.capitol.hawaii.gov/hrscurrent/Vol06_Ch0321-0344/HRS0342G/HRS_0342G-0003.htm.

Source Reduction

The State Department of Health's Office of Solid Waste Management explains that source reduction is also called "waste prevention" or "waste reduction" and means creating less waste. Although not included in the list of priorities directed in §342G-2 of the Hawaii Revised Statutes, "reuse" is also often popularly used to mean using a product over without first having to reprocess it. The product may be used for its original or intended use, or may be used in a different capacity.[50] "Recycling" is the process by which materials are collected and used as "raw" materials to create new products. All of these methods are sometimes referred to collectively as "waste diversion."[51] Because waste reduction avoids creation of waste, it is inherently difficult to quantify. In some cases, comparisons can be made to waste levels before a waste reduction practice was employed to waste levels afterward. In most cases, an estimate of the amount of waste reduced is all that is possible.

Reuse of products or materials is marginally easier to measure than waste reduction because it involves actual material. It can be measured counting the units of a particular product being reused or measuring its tonnage. However, effectively measuring reuse is difficult because it takes place at so many levels and on an unregulated and widespread scale. Take for example the reuse of plastic and glass containers for food storage at home or in the workplace. While this particular activity contributes to overall waste reduction, it is impossible to accurately measure.

Bioconversion/Composting

Bioconversion programs and laws have also been in existence since 1991 through §342G-45 and §342G-46 of the Hawaii Revised Statutes. Figure 6 depicts the amount of organic matter (green waste, food waste, fats, oils and grease used for biofuels) that was either bioconverted or composted by the counties of Hawaii, Honolulu, and Kauai between 2009 and 2016. Bioconversion can direct organic materials, including plant and animal waste, from landfills and wastewater systems and convert these materials into usable products.

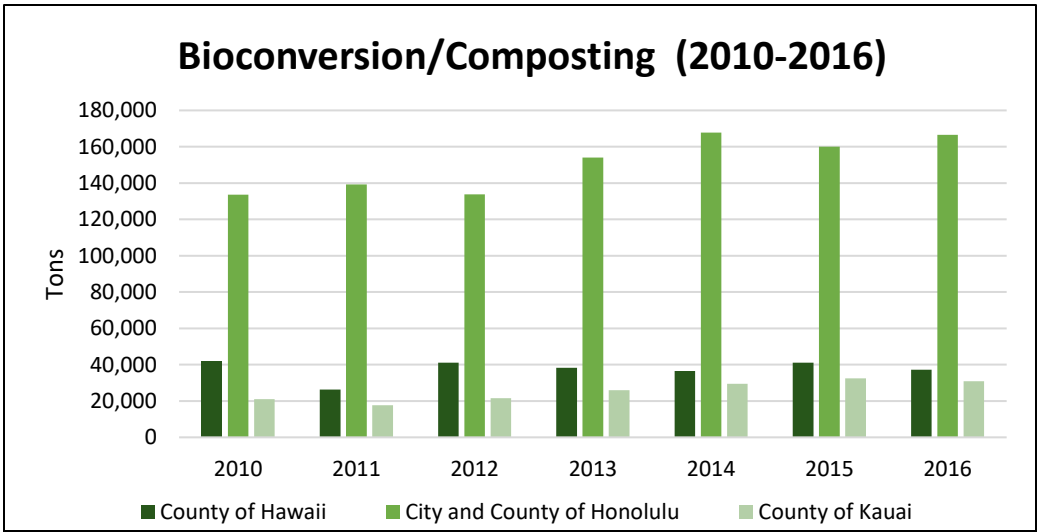

Figure 6. Bioconversion/Composting Amounts (2010-2016).
Compiled from data provided by the City and County of Honolulu, the County of Hawaii, and the County of Kauai.

[50] State of Hawaii Department of Health, Office of Solid Waste Management. (2015). 2016 Annual Report to the Legislature. Retrieved from: https://health.hawaii.gov/shwb/files/2013/06/2016_OSWM_Annual_Report.pdf.
[51] Ibid.

Recycling

Figure 7 illustrates the compiled information provided by each county's recycling efforts for the past seven years to provide a statewide prospective of Hawaii's recycling efforts by product.

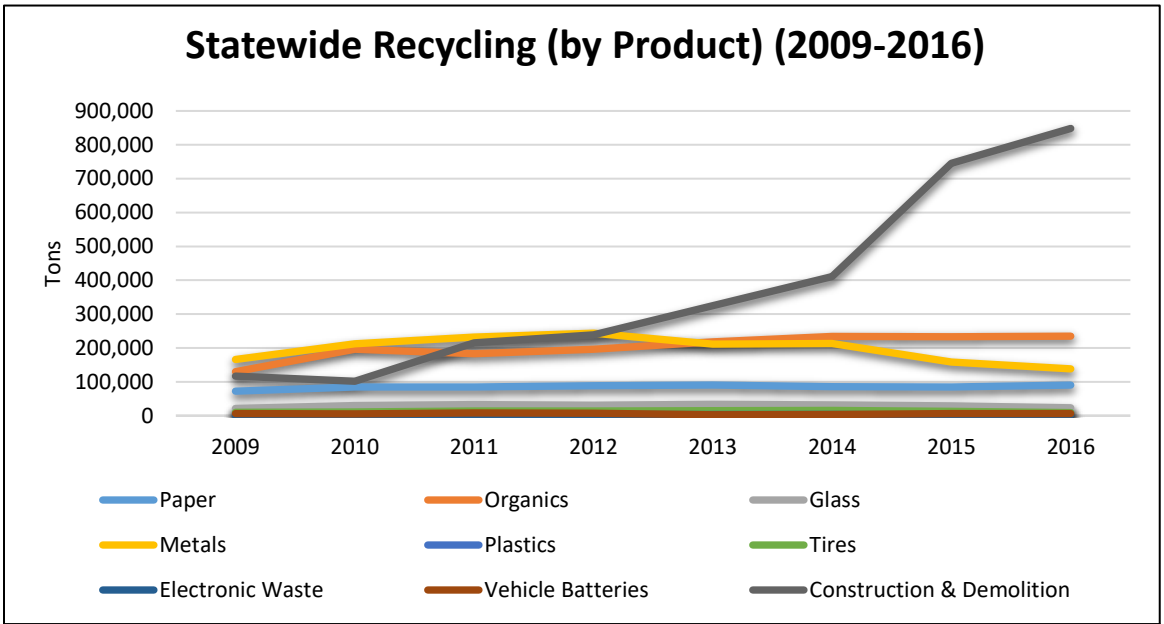

Figure 7. Statewide Recycling (by Product) (2009-2016).
Compiled from data provided by the City and County of Honolulu, the County of Hawaii, the County of Maui, and the County of Kauai.

State's Glass Container Recovery Law, Advance Disposal Fee

A long standing recycling law is the State's Glass Container Recovery Law, enacted in 1994 created the glass advance disposal fee (ADF).[52] The purpose of this fee was to encourage glass recycling, and for glass container importers to pay an advance disposal fee to fund county recovery glass programs.

A recent State Auditor's Report (17-04) reported that after glass importers pay their quarterly or annual advance deposit fees to the State Department of Health, the fees are deposited into the ADF account within the Environmental Management Special Fund.[53] Those who import or manufacture fewer than 5,000 non-deposit beverage glass containers per year, however, are exempt from the advance disposal fee. Around the beginning of each fiscal year, the Department of Health's Office of Solid Waste Management will estimate the revenue it expects to collect for the remaining fiscal year based on revenues to date. The Department of Health's Office of Solid Waste Management then executes a contract with each of the counties based off this projection for the implementation of the glass recycling program. Counties then pay the recycler to collect and transport non-deposit beverage glass either to the U.S. mainland for recycling or reuse. The State distributes 90% of the ADF revenues to counties based on each county's population to fund their glass recovery programs. Each county is required to run a glass recovery program, according to §342G-86 of the Hawaii Revised Statutes, which must include some form of a glass incentive or "buyback" program to encourage participation.

[52] Glass Container Recovery Act. (1994). Hawaii Revised Statutes §342G-Part VII. Retrieved from: https://www.capitol.hawaii.gov/hrscurrent/Vol06_Ch0321-0344/HRS0342G/HRS_0342G-0081.htm.
[53] State of Hawaii, Office of the Auditor. (2017). Follow-Up on Recommendations from Report No. 14-16, *Audit of the Department of Health's Glass Advance Disposal Fee Program.* Retrieved from: http://files.hawaii.gov/auditor/Reports/2017/17-04.pdf.

A 2014 State Audit of the State's ADF Program provides nine recommendations for the Department of Health [54]:

1. Work with the Legislature to update the State's waste disposal goals to ensure the goals are measurable and revised when necessary.
2. Work with the Legislature to clarify whether the purpose of the glass ADF is to fully or partially fund county glass collection programs.
3. Adopt administrative rules that include, but are not limited to, recycling goals for non-deposit glass, performance measures for the glass ADF, a schedule when counties are notified of ADF allocations and formalizing contracts, reporting requirements and supporting documents, and a process for returning unspent ADF funds at the end of the annual contract periods.
4. Adopt written procedures for the glass ADF program that include but are not limited to, contract administration, accounting, enforcement and compliance, and the collection and compilation of glass ADF data presented in annual reports to the Legislature.
5. Revise the scope of services in contracts with counties to include requiring supporting documents for costs such as administrative costs and incentive rates.
6. It the DOH elects to retain reimbursement as a preferred method of payment, then it should coordinate with counties to establish a new method for calculating ADF allocations that is timely and accurate.
7. Require the City & County of Honolulu to return unspent ADF funds that were allocated in previous years, taking into account that reserve ADF funds the county used in FY 2012 at the department's request.
8. Suspend allocation of glass ADF funding to the County of Kauai until the Department reaffirms whether the buyback program required for counties to receive glass ADF funds is satisfied by participation in the deposit beverage container 5¢ redemption system.
9. Continue to request from the Legislature funds to update the State's integrated waste management plan and additional staff to adequately administer the glass ADF.

The State Auditor's 2017 Follow-up Report found that five of nine recommendations provided in 2014 were not implemented.[55] It is important to note that the State's glass ADF program was significantly affected by the implementation of the Deposit Beverage Container (HI-5 "Bottle Bill") program. The Office of Solid Waste Management's 2016 Annual Report explains that on October 1, 2004, the glass deposit beverage containers were transferred from the ADF program to the Deposit Beverage Container program; this transfer reduced the number of containers covered by the ADF program by 80% and decreased the ADF's revenue.[56]

[54] State of Hawaii, Office of the Auditor. (2017). Follow-Up on Recommendations from Report No. 14-16, *Audit of the Department of Health's Glass Advance Disposal Fee Program.* Retrieved from: http://files.hawaii.gov/auditor/Reports/2017/17-04.pdf.
[55] Ibid.
[56] State of Hawaii, Department of Health, Office of Solid Waste Management. (2015). 2016 Annual Report to the Legislature. Retrieved from: https://health.hawaii.gov/shwb/files/2013/06/2016_OSWM_Annual_Report.pdf.

Deposit Beverage Container Program, "HI-5" Law

Contrary to the State's ADF program is the well-known Deposit Beverage Container "HI-5" 5¢ Law, was enacted in 2002 as Act 176 ("Bottle Bill"), codified as Chapter 342G, Part VIII of the Hawaii Revised Statutes. The purpose of this law was to increase participation in deposit programs, increase recycling rates for specified deposit beverage containers, provide a connection between manufacturing decisions and recycling program management, and reduce litter. This law requires that manufacturers and distributors of beverage containers be responsible for paying deposits and fees into the Deposit Beverage Container fund when they sell, donate, or otherwise distribute beverages in applicable containers in Hawaii.

These manufacturers and distributors may pass on the deposits and container fees they pay to their customers (retailers), who, in turn, may pass on the costs to consumers. The deposit is 5¢ per container and the fee is 1¢ per container on each eligible beverage container manufactured in or imported into Hawaii.

AS OF JUNE 2016, THERE WERE **75** CERTIFIED REDEMPTION CENTERS IN HAWAII

HAWAII COUNTY:	21
MAUI COUNTY:	12
LANAI:	1
MOLOKAI:	2
HONOLULU COUNTY:	32
KAUAI COUNTY:	7

Hawaii State Auditor

The original container fee was 1.5¢ in September 2012, but was lowered effective September 2015 to 1¢ due to the statewide redemption rates falling below 70%. In accordance to the Deposit Beverage Container Law, the State Auditor produced six biennial financial and program audits of the State's Deposit Beverage Container Program since 2005.

The State Office of the Auditor's 2017 Report No. 17-02 provides the following "HI-5" Deposit Container Redemption Rates as depicted through Figure 8 [57]:

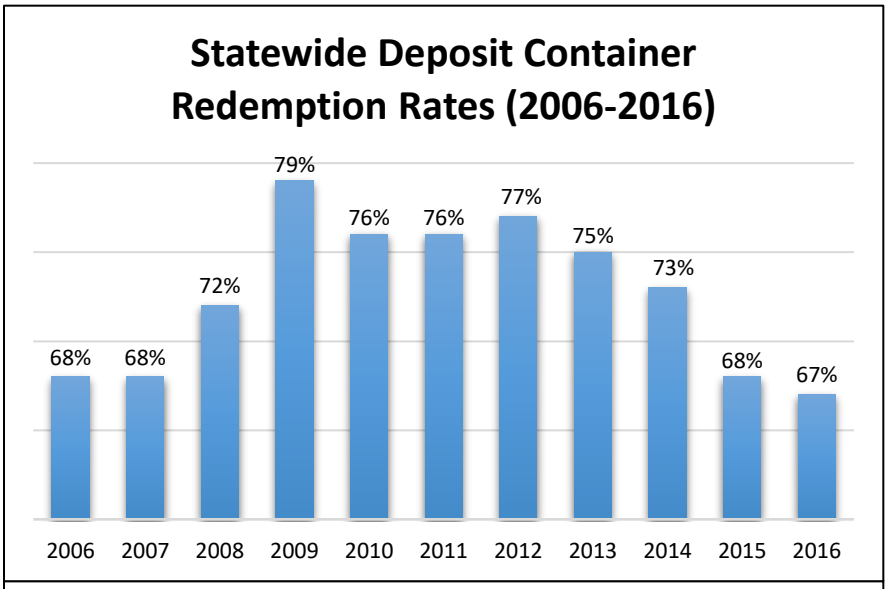

Figure 8. State Deposit Container Redemption Rates (2006-2016).
Source: Hawaii State Auditor.

[57] State of Hawaii, Office of the Auditor. (2017). Financial and Program Audit of the Deposit Beverage Container Program, June 30, 2016. Retrieved from: http://files.hawaii.gov/auditor/Reports/2017/17-02.pdf.

The State Auditor's 2017 Report warns that the Deposit Beverage Container Program relies on self-reported data from distributors and certified redemption centers and lacks adequate controls to monitor accuracy and completeness of the information submitted by distributors and certified redemption centers. This lack of adequate control exposes the program to risks of underpayments by distributors and overpayments to certified redemption centers, either of which the State Auditor notes, exposes the program to fraud, results in higher costs, and generates unreliable redemption rate reports, all of which result in financial harm to the State.[58]

Incineration

Hawaii's many sustainability-related goals and laws call for both clean energy conversion while also pursuing waste reduction goals. The Hawaii Clean Energy Initiative and the Hawaii 2050 Sustainability Plan both seek to reduce fossil fuel use. While the Hawaii Integrated Solid Waste Management Act and the Hawaii 2050 Sustainability Plan seek to increase recycling, reuse, and waste reduction strategies, a recent debate revealed some contention and conflict between the State's clean energy goals and recycling goals.

A 2017 City and County of Honolulu Audit of the City's Recycling Program (17-06) found that Honolulu's market of selling and buying recycled waste declined, and, as a result, the revenues from the sale of solid waste were insufficient to offset the costs of processing the collected recycled waste.[59] The City's audit found that the City was effective in its efforts to divert municipal solid waste and recycling. The audit also revealed that these efforts have contributed significantly to landfill diversion. The audit suggested that solid waste disposal costs could be reduced by diverting recycled waste to the H-POWER waste to energy facility.[60]

The Hawaii Integrated Solid Waste Management Act, however, defines "incineration" as a method of waste disposal not recycling. Therefore, as stated in their 2016 Annual Report, the Department of Health's Office of Solid Waste Management cannot concur with the position that incineration is a form of recycling.[61] Furthermore, the Department of Health's Office of Solid Waste Management explains that the hierarchy of solid waste management practices defined in §342G-2 of the Hawaii Revised Statutes that incineration (or waste to energy) should be considered after (1) source reduction and (2) recycling and bioconversion, including composting.[62] The Department of Health's Office of Solid Waste Management explains that if incineration is considered recycling, there will be less of an incentive to retrieve recyclable materials for the creation of new products.[63] Instead, these materials will be utilized solely for their energy value. The Department of Health's Office of Solid Waste Management recommends that such evaluations should be conducted in the next state Integrated Solid Waste Management Plan, pending available funding.[64]

[58] State of Hawaii, Office of the Auditor. (2017). Financial and Program Audit of the Deposit Beverage Container Program, June 30, 2016. Retrieved from: http://files.hawaii.gov/auditor/Reports/2017/17-02.pdf.
[59] City and County of Honolulu, Office of the City Auditor. (2017). Audit of the City's Recycling Program. https://www.honolulu.gov/rep/site/oca/oca_docs/City_Recycling_Program_Final_Report_rev._102717.pdf.
[60] Ibid.
[61] State of Hawaii, Department of Health, Office of Solid Waste Management. (2015). 2016 Annual Report to the Legislature. Retrieved from: https://health.hawaii.gov/shwb/files/2013/06/2016_OSWM_Annual_Report.pdf.
[62] Ibid.
[63] Ibid.
[64] Ibid.

Recycling Market

Worldwide waste generation rates are rising. According to the World Bank, the world's cities generated 1.3 billion tons of solid waste per year, which amount to a footprint of 2.6 lbs per person per day.[65] A 2012 World Bank study estimates that with rapid population growth and urbanization, municipal waste generation is expected to grow by 70% to 2.2 billion tons by 2025.[66] A 2017 World Bank brief warns that poorly managed waste serves as a breeding ground for disease vectors, contributes to global climate change through methane generation, and promotes urban violence.[67]

Recycling in Hawaii has its limitations. Unless the materials can be economically recycled within Hawaii, they are either shipped to the U.S. mainland, South Asia, or China. Scrap and waste are the sixth largest U.S. export to China.[68] China has long-served as the world's recycling center. The Bureau of International Recycling China estimated that in 2016, China imported 7.3 million tons of plastics and 27 million tons of waste paper from Europe, the U.S., and Japan.[69] However, in July 2017, China announced to the World Trade Organization that severe restrictions prohibiting the import of recyclable materials including many variations of waste paper and plastics would be effective by the end of 2017.[70] By October 2017, the prohibition of importing the world's paper and plastic recyclables into China began and created a blockage of the global waste disposal system.[71] As Hawaii reflects upon its local recycling laws, goals, data, as well as the recent effects of the global recycling market, Hawaii must also consider that Hawaii's local recycling industry and market may need additional investment for local reuse and recycling opportunities for a stronger sustainable future.

[65] The World Bank. (April 2017). Brief: Solid Waste Management. Retrieved from: http://www.worldbank.org/en/topic/urbandevelopment/brief/solid-waste-management.
[66] Hoornweg, Daniel; Bhada-Tata, Perinaz. 2012. *What a Waste: A Global Review of Solid Waste Management*. Urban Development Series; Knowledge Papers no. 15. World Bank, Washington, DC. Retrieved from: https://openknowledge.worldbank.org/handle/10986/17388.
[67] The World Bank. (April 2017). Brief: Solid Waste Management. Retrieved from: http://www.worldbank.org/en/topic/urbandevelopment/brief/solid-waste-management.
[68] CNN Money. (Sept 2017). China to US: Please Stop Sending Us Your Junk. Retrieved from: http://money.cnn.com/2017/09/11/news/china-scrap-ban-us-recycling/index.html.
[69] BBC News. (October 2017). The Chinese Blockage in the Global Waste Disposal System. Retrieved from: http://www.bbc.com/news/business-41582924.
[70] World Trade Organization. (July 2017). Catologue of Solid Wastes Forbidden to Import into China by the End of 2017. Retrieved from: https://resource-recycling.com/resourcerecycling/wp-content/uploads/2017/07/CHN1211.pdf.
[71] BBC News. (October 2017). The Chinese Blockage in the Global Waste Disposal System. Retrieved from: http://www.bbc.com/news/business-41582924.

5. Develop a More Diverse and Resilient Economy

The Hawaii 2050 Sustainability Plan emphasized that a sustainable Hawaii cannot occur without a sustainable economy. The 2008 plan stressed the need to diversify Hawaii's economy and to make the economy more resilient in the face of an unpredictable future. The Hawaii 2050 Sustainability Plan suggested opportunities including diversified agriculture, fisheries, and knowledge-and innovation-based industries like high tech, healthcare, biotechnology, film and digital media as important factors in building a sustainable economy.

Hawaii's Economic Diversification

A recent 2017 report published by the Economic Research Organization at the University of Hawaii (UHERO) highlights the role of clusters in Hawaii's economy through *A New Perspective on Hawaii's Economy: Understanding the Role of Clusters.*[72] According to UHERO, a "cluster" is a regional concentration of related industries that are connected by workforce, skillsets, technologies, and other industry connections. A cluster analysis can help diagnose a region's economic strength and challenges and can determine realistic ways to shape the region's economic future. Understanding clusters as important features of economies can make regions uniquely competitive for jobs and private investment. Clusters consist of companies, suppliers, and service providers, as well as government agencies and other institutions that provide specialized training and education, information, research, and technical support.

Regional economies consist of two types of clusters: traded clusters and local clusters. Traded clusters are the groups of similar industries that serve markets beyond the region where they are located. Traded clusters compete in cross-regional markets and experience competition from other regions; they serve as the engines of regional economies. Local clusters consist of industries which serve the local market. Both types of clusters work together to support a healthy and prosperous regional economy.

Statewide Economic Clusters

UHERO's *A New Perspective on Hawaii's Economy* found that in 2014, 37% of Hawaii's traded employment was a part of strong traded clusters; this ranked Hawaii as 25th among all 50 states.[73] Although typical states throughout the U.S. have economies based on ten strong traded clusters, Hawaii only had three. As shown in Figure 9, Hawaii's three strongly traded clusters in 2014 were the hospitality and tourism cluster, the water transportation cluster, and the jewelry and precious metals cluster. UHERO found that Hawaii's hospitality and tourism cluster was the largest and strongest of traded clusters across the state, consisting of more than 55,000 jobs in 2014. The other two strongly traded clusters in Hawaii employed less than 4,000 personnel.

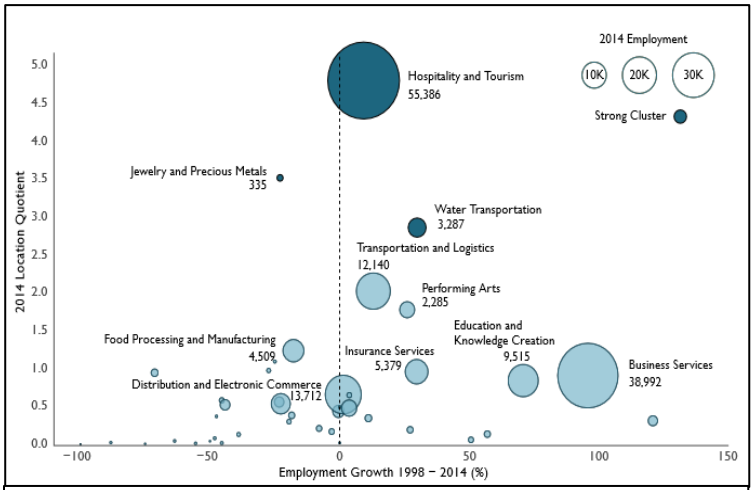

Figure 9. Statewide Traded Clusters (1998-2014).
Courtesy: UHERO, data from US Cluster Mapping Project.

[72] The Economic Research Organization at the University of Hawaii. (2017). UHERO Report: *A New Perspective on Hawaii's Economy: Understanding the Role of Clusters.* Retrieved from: http://www.uhero.hawaii.edu/assets/New_Perspective_Hawaii.pdf.
[73] Ibid.

Honolulu Economic Clusters

The City and County of Honolulu was found to have stronger traded clusters than the statewide clusters with a count of nine strong traded clusters, employing 57% of total traded employment. As shown in Figure 10, the City and County of Honolulu's mix of industry is due to its role Hawaii's most populated county while serving as the central point of the State's transportation networks, State Government, and federal defense interests; the report found that Hawaii's three other counties were more reliant upon the hospitality and tourism cluster. Honolulu's nine strong traded clusters were: hospitality and tourism, transportation and logistics, water transportation, jewelry and precious metals, apparel, performing arts, footwear, insurance services, and education and knowledge creation.[74] According to the UHERO Report, only three of the nine strong traded clusters grew in Honolulu during the 1998-2014 period; the education and knowledge creation cluster created the most jobs in the county, adding 3,550 jobs with an annual growth rate of 3%. The water transportation cluster added 542 jobs and experienced an annual growth rate of 1%.

UHERO's *A New Perspective on Hawaii's Economy* explains Honolulu County differs from Hawaii's three other counties and most other U.S. regions because of the dominant role in federal defense spending in Honolulu's economy. Recently in Fiscal Year 2014, Honolulu County was populated with 67,354 military personnel while the counties of Maui and Hawaii had 600 personnel, and Kauai County had 250 military personnel. Fiscal Year 2014 produced $6.7 billion in U.S. defense spending into the State of Hawaii, representing 9.9% of the state's gross domestic product (GDP), and 14% of the county's GDP.

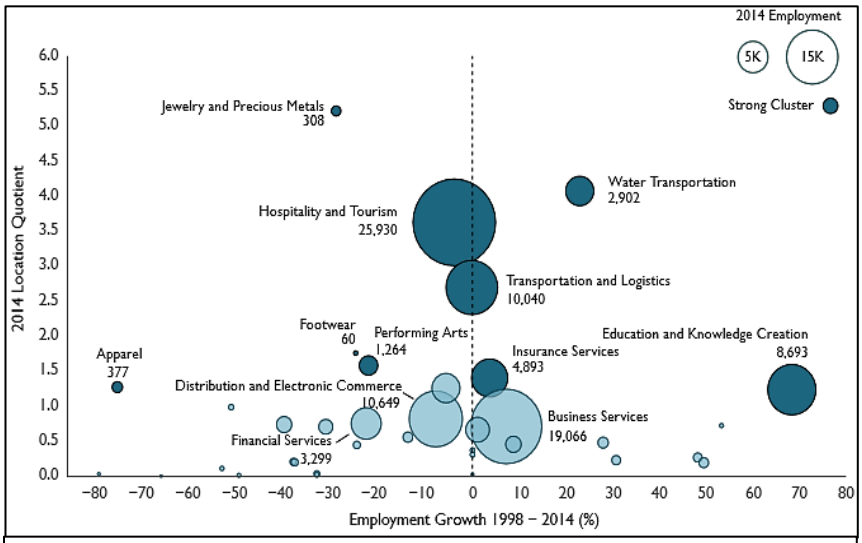

Figure 10. Honolulu's Traded Clusters (1998-2014).
Courtesy: UHERO, data from the US Cluster Mapping Project.

[74] The Economic Research Organization at the University of Hawaii. (2017). UHERO Report: *A New Perspective on Hawaii's Economy: Understanding the Role of Clusters.* Retrieved from: http://www.uhero.hawaii.edu/assets/New_Perspective_Hawaii.pdf.

Maui County Economic Clusters

Contrary to Honolulu County, which enjoys the most diversified economy, Maui's economic cluster reflected a strong reliance on hospitality and tourism cluster, as shown in Figure 11. While Maui was found to be heavily reliant on the hospitality and tourism cluster, three other strong clusters were identified by UHERO; however, they only have a combined employment of 1,000 workers. These three other strong clusters between 1998 and 2014 were: the performing arts cluster which added around 700 jobs and enjoyed an annual growth rate of 13%, the water transportation cluster, which grew at an annual growth rate of less than 2%, and music sound recording cluster, which did not grow over the past 16 years yet remained a strong traded cluster for Maui. UHERO found that since 71.8% of Maui's total traded employment was in these four strong clusters.[75]

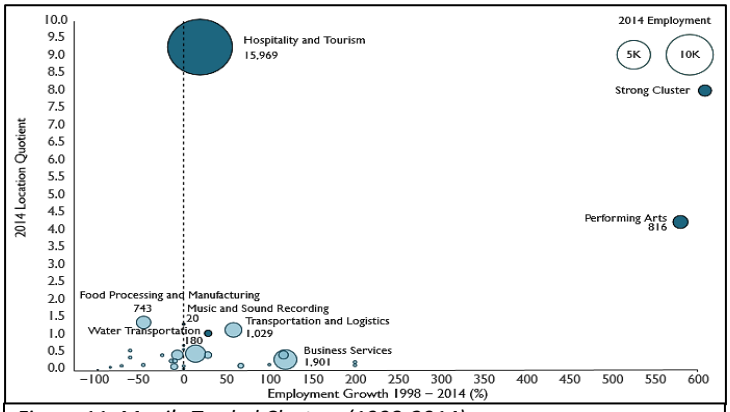

Figure 11. Maui's Traded Clusters (1998-2014).
Courtesy: UHERO, data from the US Cluster Mapping Project.

Kauai County Economic Clusters

Similar to Maui, Kauai County's economic clustering heavily relies on the hospitality and tourism cluster, which employs more than 6,000 workers. UHERO found that Kauai County had five strong traded clusters, including the hospitality and tourism cluster, performing arts, fishing and fishing products, jewelry and precious metals, and music and sound recording.[76] Besides the hospitality and tourism cluster, the remaining four strong traded clusters employ a total of 215 people. UHERO found that 62.9% of Kauai's total traded workforce was in the strong traded clusters. Of all of Kauai's economic clusters, the education and knowledge creation cluster was Kauai's fastest growing cluster between 1998 and 2014 with an annual growth rate of 18%. Though the education and knowledge cluster added 245 jobs, it was not one of the strong traded clusters. Kauai's fastest strong traded cluster was its performing arts cluster which added 135 jobs at an annual growth rate of 9%.

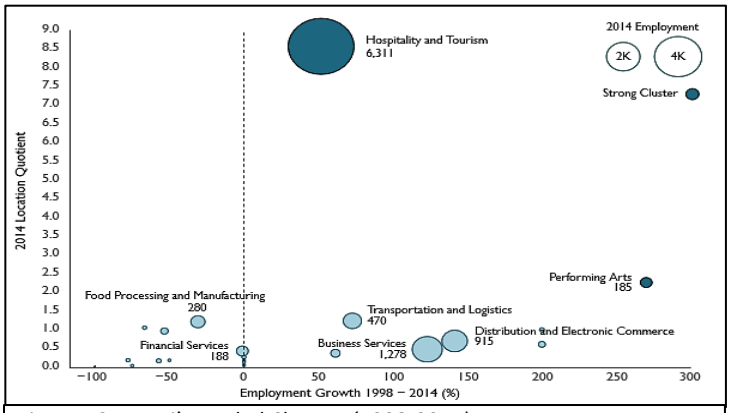

Figure 12. Kauai's Traded Clusters (1998-2014).
Courtesy: UHERO, data from the US Cluster Mapping Project.

[75] The Economic Research Organization at the University of Hawaii. (2017). UHERO Report: *A New Perspective on Hawaii's Economy: Understanding the Role of Clusters.* Retrieved from: http://www.uhero.hawaii.edu/assets/New_Perspective_Hawaii.pdf.
[76] Ibid.

Hawaii County Economic Clusters

Figure 13 shows Hawaii County's hospitality and tourism cluster was also found to be one of four strong traded clusters employing around 8,000 people on the island with the remaining three strong traded clusters: fishing and fishing products, music and sound recording, and water transportation, employing under 250 people. UHERO found that similar to Kauai and Maui, Hawaii County's large hospitality and tourism cluster enables 54.2% of total traded employment in the county's strong traded clusters. Hawaii County's fastest growing traded cluster was the business services cluster with an annual growth rate of 9% adding 481 jobs to the economy.[77]

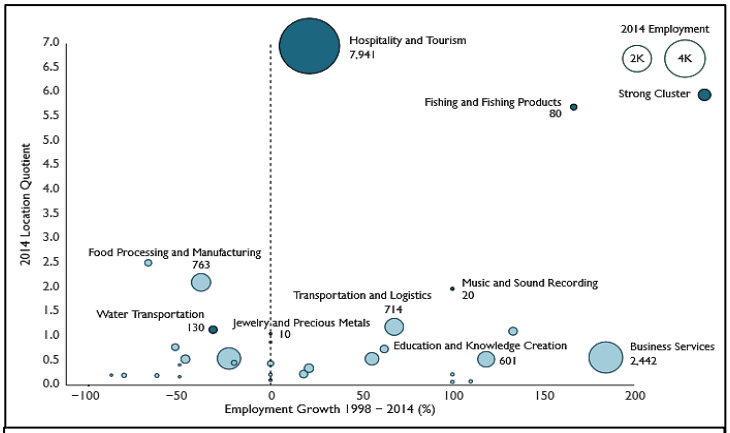

Figure 13. Hawaii Island Traded Clusters (1998-2014).
Courtesy: UHERO, data from the US Cluster Mapping Project.

Emerging Economic Clusters

1) Education and Knowledge Creation Cluster

UHERO's *A New Perspective on Hawaii's Economy: Understanding the Role of Clusters* identified Hawaii's education and knowledge creation cluster as one of Hawaii's fastest growing clusters between 1998 and 2014.[78] Although the education and knowledge creation cluster is not categorized as a strong traded cluster statewide, it was in the top tier of job creating clusters for Honolulu's, Kauai's and Hawaii County's economies. This cluster was the fastest growing cluster for Kauai and Honolulu and was the second fastest growing in Hawaii County; it especially paid the highest wage among all economic clusters in Hawaii County.

2) Energy Innovation Cluster

UHERO's analysis considered the emergence of a Hawaii energy innovation cluster, primarily generated from recent growth in the alternative electric power subcluster, comprised of businesses generating electricity through geothermal, biomass, solar, wind, hydroelectricity, and other non-fossil fuels. The period of the study between 1998 and 2014 showed that 80 jobs in alternative electric power were added statewide, with the majority of these jobs found in Hawaii County, providing Hawaii County with a high concentration in renewable energy employment opportunities.[79] UHERO noted that the electric power generation and transmission cluster remains a local cluster throughout the state, and is not a traded or a strong traded cluster.

[77] The Economic Research Organization at the University of Hawaii. (2017). UHERO Report: *A New Perspective on Hawaii's Economy: Understanding the Role of Clusters.* Retrieved from: http://www.uhero.hawaii.edu/assets/New_Perspective_Hawaii.pdf.
[78] Ibid.
[79] Ibid.

UHERO expects that Hawaii's economy will significantly benefit if a transition of energy technologies lead to lower electricity costs. Such a transition will allow Hawaii's electric power generation and transmission cluster to grow at the rate of Hawaii's overall economy as a local cluster. To shift Hawaii's electric power generation and transmission from a local cluster to a traded cluster, UHERO suggested using Hawaii's renewable energy goals to stimulate research and development and innovation opportunities, which are traded clusters, to evolve into a "Hawaii energy innovation cluster."

UHERO identified that research and development and innovation opportunities within renewable energy in Hawaii are emerging through the education and knowledge creation and the business services clusters. Industries within research and development and innovation sectors, including Hawaii's physical engineering and life sciences industry, grew 39% in between 2001 to 2014; this was 14% greater than the industry's national growth rate.

UHERO explained that state policies and the market drive for renewable energies pushed this economic diversification. Hawaii's counties are the most isolated markets compared to other U.S. counties, and Hawaii's renewable resources (wind, sun, and ocean) and high electrical costs have led to substantial investments to drive Hawaii to become a leader in innovation in renewable energy generation and transmission.

Hawaii's Targeted and Emerging Industries

The State's Innovation Initiative through Act 148 in 2007, codified as §201-19 of the Hawaii Revised Statutes, mandated DBEDT to create and update a database on defining and measuring Hawaii's emerging industries and develop appropriate outcome measures to assess the effectiveness of the State's Innovation Initiative in promoting economic diversification, growth, and stability in Hawaii.[80] DBEDT published two reports in 2008 and 2011 to measure the economic diversification in Hawaii, these reports measured the earlier decades spanning from 1990 - 2000, and 2000 - 2009.[81,82] Since 2009, DBEDT suggested a range of economic activities as candidates for diversifying the State's economy through a "Targeted Industry Portfolio." The portfolio industries were also grouped into major areas of interest such as technology, creative, and agribusiness.[83]

Hawaii's Targeted & Emerging Industries: 2016 Update illustrates how targeted industries have performed after the recovery period of the recession. This update summarized the best performing targeted industry groups for the 2006 - 2016 period in terms of their average growth and national competitiveness.

The *Hawaii's Targeted & Emerging Industries: 2016 Update* found the following industries to be Hawaii's best performing targeted industry groups between 2006 and 2016 as depicted through Table 6[84]:

1. Alternative Power Generation
2. Hospitals and Nursing Facilities
3. Film, TV, Video Production Distribution
4. Agricultural Inputs
5. Business Consulting
6. Technical Consulting Services

[80] Hawaii Revised Statutes §201-19. Research and Statistics for Growth Industries. Retrieved from: https://www.capitol.hawaii.gov/hrscurrent/Vol04_Ch0201-0257/HRS0201/HRS_0201-0019.htm.
[81] State of Hawaii, Department of Business Economic Development and Tourism, Research and Economic Analysis Division. (2008). Measuring Economic Diversification in Hawaii. Retrieved from: http://files.hawaii.gov/dbedt/economic/data_reports/EconDiversification/Economic_Diversification_Report_Final%203-7-08.pdf.
[82] State of Hawaii, Department of Business Economic Development and Tourism, Research and Economic Analysis Division. (2011). Measuring Economic Diversification in Hawaii. Retrieved from: http://files.hawaii.gov/dbedt/economic/data_reports/reports-studies/2011-12-diversification.pdf.
[83] State of Hawaii, Department of Business Economic Development and Tourism. (2009). Report to the 2009 Legislature: *Efforts to Support Emerging Growth Industries*. Retrieved from: http://files.hawaii.gov/dbedt/annuals/2009/PerformReport09Final.pdf.
[84] State of Hawaii, Department of Business Economic Development and Tourism. (2016). Hawaii's Targeted and Emerging Industries: 2016 Update Report. http://files.hawaii.gov/dbedt/annuals/2016/2016-targeted-industries.pdf.

Table 6. Overall Performance of Hawaii's Targeted Industry Portfolio (2006 – 2016)

INDUSTRY GROUPS	JOBS IN HAWAII		AVG. ANN. JOB GROWTH (2006-2016P)		CONCENTRATION OF INDUSTRY IN HAWAII COMPARED TO U.S.		AVG ANNUAL EARNINGS (2016P)	
	2016P	CHANGE 2006-2016P	HAWAII	U.S.	2016P	% Point CHNG 2006-2016P	HAWAII	U.S.
TOTAL CIVILIAN JOBS	867,947	69,427	0.8%	0.9%	100%	0%	$51,541	$55,531
TOTAL TARGETED JOBS WITHOUT OVERLAP	160,488	22,324	1.5%	1.6%	81%	0%	$55,277	$67,782
Base-Growth and Emerging Activities								
Above Average State Earnings								
Alternative Power Generation	312	223	13.4%	-4.2%	102%	84%	$109,040	$158,376
Hospitals & Nursing Facilities	21,100	3,213	1.7%	1.1%	69%	4%	$81,047	$65,331
Film, TV, Video Production/Distrib	1,494	138	1.0%	0.5%	78%	4%	$67,222	$99,858
Agric. Inputs	483	100	2.3%	0.4%	43%	8%	$63,998	$68,966
Business Consulting	5,050	1,541	3.7%	3.3%	59%	3%	$54,032	$78,628
Technical Consulting Services	4,634	1,566	4.2%	4.0%	63%	2%	$53,312	$77,778
Below Average State Earnings								
Agric. Processing	7,285	784	1.1%	0.9%	95%	3%	$48,543	$58,264
Specialty Health Care Services	11,378	4,450	5.1%	5.1%	91%	1%	$48,202	$42,405
Cultural Activities	3,573	1,977	8.4%	2.8%	392%	163%	$45,549	$52,548
Agric. Support Services	1,532	385	2.9%	2.0%	59%	6%	$44,592	$51,666
Music	1,484	391	3.1%	2.2%	163%	16%	$42,988	$38,546
Fishing, Forestry & Hunting	1,887	190	1.1%	0.5%	344%	21%	$32,249	$35,800
Higher Education	6,468	1,909	3.6%	2.0%	70%	11%	$30,472	$53,501
Farm Production	13,906	1,324	1.0%	0.6%	95%	4%	$29,433	$30,440
Apparel	1,546	304	2.2%	-1.9%	180%	61%	$21,515	$37,958
Art Education	924	324	4.4%	3.5%	78%	8%	$8,867	$10,673

Source: Department of Business Economic Development and Tourism, "Hawaii's Targeted & Emerging Industries: 2016 Update Report".

HI Growth Initiative

The Department of Business Economic Development and Tourism's (DBEDT) Hawaii Strategic Development Corporation (HSDC) began the HI Growth Initiative in 2011 to develop a vibrant entrepreneurial ecosystem for private sector investors. Between 2012 and 2016 the HI Growth Initiative established Hawaii as a viable place to build competitive startups.[85] Another UHERO Report, *The Evolution of the HI Growth Initiative*, published in 2016, found 65 companies were funded as a result of the HI Growth Initiative. The average capital investment from the State's HI Growth Initiative was $160,000 per company, representing the cumulative investment of $10.8 million, generating over $60 million in funding with over 150 Hawaii-based jobs.[86,87]

UHERO's *A New Perspective on Hawaii's Economy* reaffirmed that energy innovation industries grew rapidly over the previous decade due to several factor conditions like the HI Growth Initiative and accelerator programs, home demand conditions, a strong policy framework, and market competition, which support the growth of Hawaii's energy innovation cluster.[88] UHERO recommended that government continue to serve as a convener of cluster participants. Partnerships between the Hawaii Venture Capital Association, the Hawaii Strategic Development Corporation, and the Hawaii Technology Development Corporation proved to be successful for emerging markets and a diversified economy. Identifying common needs between Hawaii's clusters like shared infrastructure and services can strengthen Hawaii's economy. UHERO concluded by recommending the development of a policy to upgrade all of Hawaii's clusters within the region will align with the government's role in providing high quality public goods and services.

[85] State of Hawaii, Department of Business Economic Development and Tourism, Hawaii Strategic Development Corporation. (2017). HI Growth Initiative. Retrieved from: http://hsdc.hawaii.gov/hi-growth-initiative/.
[86] The Economic Research Organization of the University of Hawaii. (2016). The Evolution of the Hawaii Growth Initiative. Retrieved from: https://hsdc.hawaii.gov/wp-content/uploads/2017/10/Evolution_HIGrowth_Initiative1.pdf.
[87] The Economic Research Organization at the University of Hawaii. (2017). UHERO Report: *A New Perspective on Hawaii's Economy: Understanding the Role of Clusters.* Retrieved from: http://www.uhero.hawaii.edu/assets/New_Perspective_Hawaii.pdf.
[88] Ibid.

6. Create a Sustainability Ethic

The people of Hawaii have long embraced the practice of sustainability. In 1973, State Senator Kenneth ("Kenny") Brown spoke of the need for the "Mālama Ethic" (to take care of, to care for) in the planning of Hawaii's future. Through his practice of "Mālama Hawaii," Sen. Kenny Brown envisioned a five-part model: a code of conduct for communities that integrated social justice, environmental protection, health and wellness, business, and education. This Mālama Ethic was the foundation of Hawaii's historical sustainability ethic. The 1978 Constitutional Convention amended the Hawaii State Constitution to focus on Hawaii's self-sufficiency:

> For the benefit of present and future generations, the State and its political subdivisions shall conserve and protect Hawaii's natural beauty and all natural resources, including land, water, air, minerals and energy sources, and shall promote the development and utilization of these resources in a manner consistent with their conservation and in furtherance of the self-sufficiency of the State. All public natural resources are held in trust by the State for the benefit of the people. (Hawaii State Constitution, Article XI, Section 1)

Similarly, during 1978, the Hawaii State Planning Act was signed into law with its State goals being aligned with sustainable practices of balancing Hawaii's economy, environment, and social and cultural well-being:

> **1.** A strong, viable economy, characterized by stability, diversity, and growth that enables the fulfilment of the needs and expectations of Hawaii's present and future generations.
> **2.** A desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness that enhances the mental and physical well-being of the people.
> **3.** Physical, social, and economic well-being, for individuals and families in Hawaii that nourishes a sense of community responsibility, or caring, and of participation in community life.
>
> (Hawaii Revised Statutes §226-5)

Thirty years later, in 2008, the Hawaii 2050 Sustainability Plan was written and identified that 85% of Hawaii's residents considered sustainability to be a "critically important" issue to the state (p.66). The plan called for the creation of a Sustainability Council to assist the coordination, marketing, and implementation of the Hawaii 2050 Sustainability initiatives and recommendations throughout Hawaii's state and county governments, the private sector, and cross-sector.[89] Yet, over the past decade, the Sustainability Council was never established.

In 2011, the Hawaii State Planning Act was amended to direct priority guidelines and principles for the Hawaii State Plan to promote sustainability. The Hawaii State Planning Act's priority guidelines and principles of sustainability are found in §226-108 of the Hawaii Revised Statutes, and are consistent with the Hawaii 2050 Sustainability Plan's "Guiding Principles of Sustainability" (p.14).

[89] Hawaii 2050 Sustainability Task Force. (2008). Hawaii 2050 Sustainability Plan. Retrieved from: http://www.oahumpo.org/wp-content/uploads/2013/02/Hawaii2050_Plan_FINAL.pdf.

Hawaii's sustainability priority guidelines and principles for the Hawaii State Planning Act are found in §226-108 of the Hawaii Revised Statutes, as follows [90]:

> **HRS §226-108 Sustainability.** Priority guidelines and principles to promote sustainability shall include:
>
> (1) Encouraging balanced economic, social, community, and environmental priorities;
> (2) Encouraging planning that respects and promotes living within the natural resources and limits of the State;
> (3) Promoting a diversified and dynamic economy;
> (4) Encouraging respect for the host culture;
> (5) Promoting decisions based on meeting the needs of the present without compromising the needs of future generations;
> (6) Considering the principles of the ahupua'a system; and
> (7) Emphasizing that everyone, including individuals, families, communities, businesses, and government, has the responsibility for achieving a sustainable Hawaii.

Later in 2014, the State's support for sustainability was reaffirmed through the passage of Senate Concurrent Resolution 69, endorsing and supporting the Aloha+ Challenge, which was an integrated approach focusing on six ambitious targets related to clean energy, local food, natural resource management, waste reduction, smart sustainable communities, and green workforce development.[91] The same legislative resolution tasked the Hawaii State Sustainability Coordinator to submit a report to the Legislature on the launch of the Aloha+ Challenge, which included recommendations for promoting action and tracking progress on the statewide sustainability targets.[92] The temporary State Sustainability Coordinator position was vacated in April 2015 and was not re-established until June 2017. Through these many governmental transitions over the past six years, a myriad of local community groups, businesses, and non-profits continued this effort for governmental, economic, and community-led sustainable practices in Hawaii.

During this time period, in May 2014, the Polynesian Voyaging Society embarked their Polynesian double-hulled voyaging canoes, Hōkūle'a and Hikianalia, for their "Mālama Honua" voyage, a three year circumnavigation of the Earth to bring global attention to the need to take care of our Island Earth.[93] The Polynesian Voyaging Society's mission through Mālama Honua sought to engage communities worldwide on practicing to live sustainability while sharing the Polynesian culture, learning from the past and from each other, creating global relationships, and inspiring action to care for our Island Earth. After successfully visiting more than 150 ports, 23 countries and territories, and travelling a combined 60,000 nautical miles in three years, Hōkūle'a and Hikianalia returned to their home in Hawaii in June 2017, to teach the people of Hawaii, Mālama Honua: to take care of our Island Earth sustainably, and Mālama Hawaii: to take care of Hawaii sustainably. [94]

Thanks to the leadership of Polynesian Voyaging Society and Hawaii's many sustainability-advocacy groups, Hawaii's sustainability ethic remains strong. The government, however, needs to create a stronger legislative framework establishing a permanent government sustainability entity and direct responsibilities, authorities, and provide programmatic funding to this government sustainability coordinating entity. This can ensure consistency in the coordination and implementation of the many sustainability initiatives and recommendations established through the Hawaii State Planning Act's sustainability priority guidelines and principals, the Hawaii 2050 Sustainability Plan's goals and indicators, and the State's Aloha+ Challenge targets to ensure consistency of all these statewide sustainability goals throughout Hawaii's state and county governments.

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[90] Hawaii Revised Statutes §226-108. (2011). Sustainability Priority Guidelines and Principles. Retrieved from: https://www.capitol.hawaii.gov/hrscurrent/Vol04_Ch0201-0257/HRS0226/HRS_0226-0108.htm.
[91] S.C.R. 69, S.D.1, 27th Leg., Reg. Sess. (Haw. 2014).
[92] Ibid.
[93] Polynesian Voyaging society. (2017). Malama Honua Worldwide Voyage Factsheet. Retrieved from: https://drive.google.com/file/d/0BwB6gTJso7ZmekVOdFR3TGptWGs/view.
[94] Ibid.

7. Increase Production and Consumption of Local Foods and Products, Particularly Agricultural Products

The Hawaii 2050 Sustainability Plan found that food self-sufficiency is one of the foundations of a sustainable economy.[95] The 2008 Hawaii 2050 Sustainability Plan measured that about 15% of the food consumed in Hawaii was grown locally, and 35% of the fruits and vegetables consumed were locally grown. The plan further suggested that a benchmark of 30% of food consumed could be grown locally and 85% of fruits and vegetables consumed could be locally grown by 2020, according to the UH College of Tropical Agriculture and Human Resources
(CTAHR). [96]

The State of Hawaii's Office of Planning published in 2012 the *Increased Food Security and Food Self-Sufficiency Strategy* as a recommendation to increase Hawaii's food self-sufficiency by increasing the amount of locally grown food consumed by Hawaii residents, which are components to Hawaii's food security. The publication warned that Hawaii became less food self-sufficient over the past thirty years. The strategy document recounted the food conditions in 2012[97]:

- **Vegetables:** watercress, Chinese cabbage, mustard cabbage, green onions, choi sum, shanghai pak-choi, shijuku, malunggay leaves, and yard-long beans were close to self-sufficiency. Tomatoes, sweet potato, cucumber, and sweet corn were supplied 75% by local farmers; while lettuce and other vegetables were imported.

- **Fruit:** Watermelon, papaya, pineapple, and banana meet much of resident demand in Hawaii. Local residents' backyards provided a healthy supply of mango, and tropical-exotic fruit such as lychee, rambutan, and jack fruit. Other types of fruits were mostly imported, and there was a market potential for blueberries, dragon fruit, and pomegranate.

- **Livestock:** Cattle numbers decreased steadily between 1970 and 2001, stabilized in 2002, and gradually increased between 2002 and 2006. A compilation of the USDA's National Agricultural Statistics Services data reflects, however, a gradual decline of raw meat produced by Hawaii cattle over the past decade from 5,000 lbs in 2007 to 4,200 lbs in 2016.

- **Dairy:** In 1970, there were 120 local milk operations, and Hawaii was self-sufficient in milk; however, in 2009, 15 dairies remained. By 2012, there were only two dairies in operation.

- **Hogs and Pigs:** the 2012 self-sufficiency strategy notes that there was a steady decline of hogs and pigs between 1970 and 2009; however, there was no information available on the amount of local demand met by local supply.

- **Egg Farms:** In 1970, there were 240 egg farms, and Hawaii was self-sufficient in egg production. By 2009, there were only 100 egg farms still in operation. Presently, the USDA National Agricultural Statistics Service is unable to disclose egg production data to avoid disclosure of individual operations.

[95] Hawaii 2050 Sustainability Task Force. (2008). Hawaii 2050 Sustainability Plan. Retrieved from: http://www.oahumpo.org/wp-content/uploads/2013/02/Hawaii2050_Plan_FINAL.pdf.
[96] Ibid.
[97] State of Hawaii, Office of Planning. (2012). Increased Food Security and Food Self-Sufficiency Strategy. Retrieved from: http://files.hawaii.gov/dbedt/op/spb/INCREASED_FOOD_SECURITY_AND_FOOD_SELF_SUFFICIENCY_STRATEGY.pdf.

The Office of Planning's 2012 *Food Security and Food Self-Sufficiency Strategy* recommended the following actions to improve Hawaii's food self-sufficiency:

Demand

1. Expand the "Buy Local/It Matters" marketing campaign as to promote the benefits of buying local foods.

2. Expand and improve branding and 40 labelling programs and provide consumer education.

3. Encourage public institutions to purchase locally grown foods. Establish a pilot program in the charter schools.

4. To address food safety issues, increase the farm food safety coaching program and farm food safety certifiers.

Production

1. To increase production of locally grown foods, improve agricultural infrastructure including agricultural parks, irrigation systems and distribution systems/facilities.

2. Support the Agricultural Park Program, which provides public lands at reasonable cost and long-term tenure to farmers, and complete the transfer of agricultural lands from the Department of Land and Natural Resources (DLNR) to the Department of Agriculture (DOA).

3. Support Capital Improvement Project (CIP) funding to repair and maintain State irrigation systems since these systems provide water at low cost to farmers.

4. Encourage a variety of distribution systems to move goods to the market place. Nationally, direct consumer sales, farmers' markets, community-supported agriculture organizations and farm-to-school programs have all increased.

5. Support multi-functional food hub facilities or food incubator facilities to handle aggregation, processing, treatment, and distribution.

6. To build the agricultural workforce, continue the "Green Jobs Initiative" which provides workforce development services for the agricultural, energy, natural resources, and related industries.

Policy and Organization

1. Restore the Market Analysis and News Branch of DOA to track progress toward food self-sufficiency.

2. Adopt legislation to establish an Agricultural Development and Food Security Program.

3. The Strategy also contains recommendations to provide for pest prevention and control, research and extension services, and policy and organizational support. The proposed Agricultural Development and Food Security Program will help to coordinate and direct efforts to address food self-sufficiency

4. A critical factor toward successful implementation will be building partnerships with the increasing number of organizations involved in food self-sufficiency/food security.

A majority of these 2012 recommendations were not funded or implemented over the past five years. Although a recent *2015 Statewide Agricultural Land Use Baseline* was published by the University of Hilo and prepared for the State Department of Agriculture, this baseline reflects Hawaii's agricultural footprint through land use, compilation, and the study of agricultural acreage.[98] This baseline does not measure the amount of local food production or local food consumption.

The *Hawaii 2050 Issue Book*, published in support of the Hawaii 2050 Sustainability Plan, explained that neither the State's Department of Agriculture nor the Department of Business Economic Development and Tourism have an index or measure the amount of Hawaii's imported food consumption.[99] The *Hawaii 2050 Issue Book* explained that in 2008, Hawaii's limited land supply would stress Hawaii's ability to produce enough local food to be near self-sufficiency and recommended the need to use our agricultural lands more prudently, as competing uses for good farmland will affect Hawaii's local food sustainability and self-sufficiency.[100]

The *Increased Food Security and Food Self-Sufficiency Strategy* 2012 report, estimated that 80-90% of Hawaii's food was imported and made Hawaii particularly vulnerable to natural disasters and global events that could disrupt shipping and our local food supply.[101] The strategy emphasized that the economic impact of food import replacement is significant. For instance, if Hawaii was able to replace 10% of the food imported, this would amount to approximately $313 million, assuming a 30% farm share, $94 million would be realized at the farm-gate, which would generate an economy-wide impact of an additional $188 million in sales, $47 million in earnings, $6 million in state tax revenues, and more than 2,300 jobs (in 2012 dollars).[102]

The following chart attempts to measure Hawaii's local agricultural production over the past ten years. It is important to note that due to budgetary cuts and the reduction-in-force of the State Department of Agriculture in 2009, State agricultural statistical positions were cut and Federal U.S. Department of Agriculture (USDA) reorganizations in 2012 regionalized USDA statistical measuring. Since 2012, Hawaii has relied on two USDA employees to perform surveying and statistical analysis of our statewide local food production. Over the last ten years, there was a drop of annual surveys of Hawaii's local food production. Increased funding for State agricultural statisticians would likely increase the availability of local agricultural annual production surveys.

[98] State of Hawaii, Department of Agriculture, produced by the University of Hilo, Spatial Data Analysis & Visualization Research Lab. (2015). Statewide Agricultural Land Use Baseline, 2015. Retrieved from: http://hdoa.hawaii.gov/salub/.
[99] Hawaii 2050 Sustainability Task Force. (2007). Hawaii 2050 Issue Book: Building A Shared Future. Retrieved from: http://hipaonline.com/images/uploads/HI2050_Issue_Book.pdf.
[100] Ibid.
[101] State of Hawaii, Office of Planning. (2012). Increased Food Security and Food Self-Sufficiency Strategy. Retrieved from: http://files.hawaii.gov/dbedt/op/spb/INCREASED_FOOD_SECURITY_AND_FOOD_SELF_SUFFICIENCY_STRATEGY.pdf.
[102] Ibid.

The following local agricultural food production s were compiled through many U.S. Department of Agriculture annual reports, annual summaries, and *Statistics of Hawaii Agriculture* books:

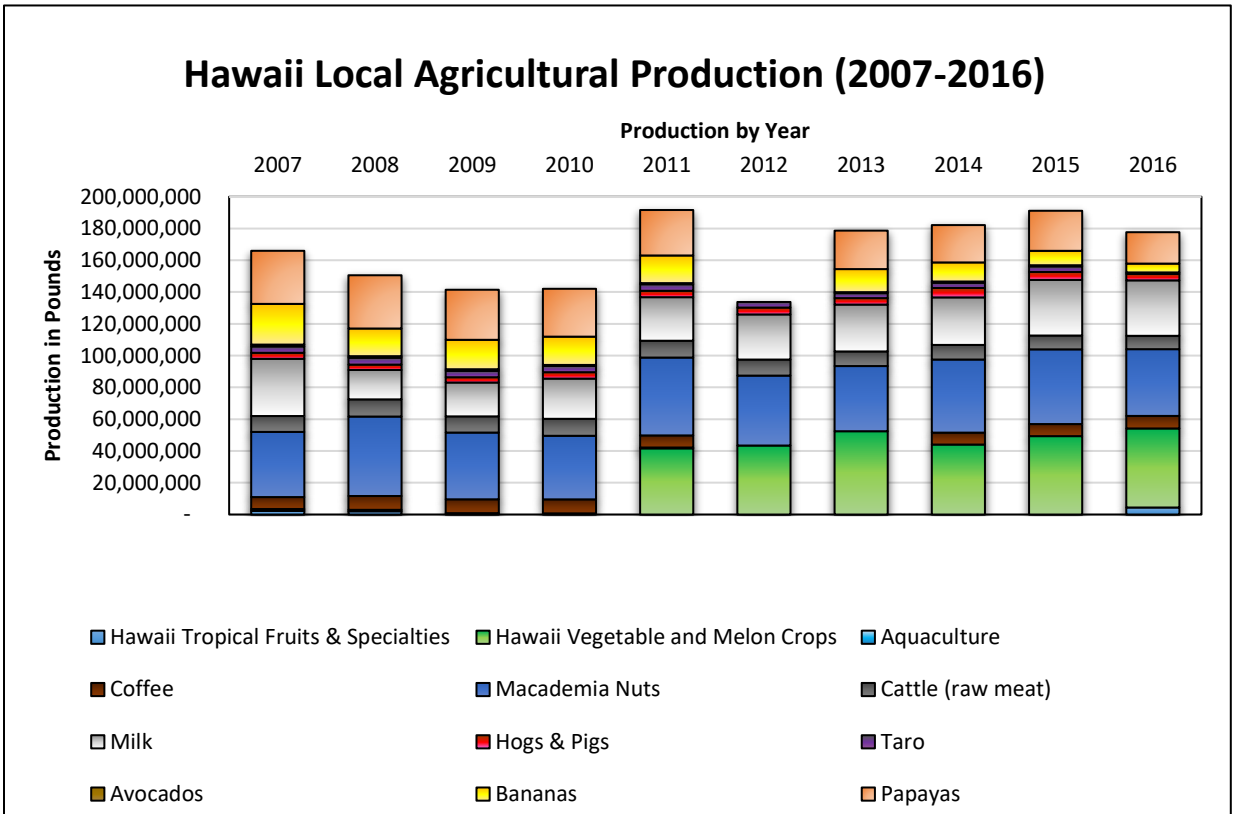

Figure 14. Hawaii Local Agricultural Production (2007-2016).

Sources: The USDA National Agricultural Statistics Service Hawaii Field Office; USDA 2016 State Agricultural Overview; 2012 USDA Census of Agriculture for Hawaii; the 2008, 2009, 2010, 2011 USDA Statistics of Hawaii Agriculture Books; 2017 USDA Hawaii Tropical Fruit and Crops Report; 2013 USDA Hawaii Vegetable and Herb Report; the 2015, 2016, 2017 USDA Hawaii Vegetable and Melon Crops Reports; the 2008, 2009, 2010, 2011, and 2016-2017 USDA Coffee Marketing Estimate Reports; and the 2011-2012, 2016-2017 USDA Hawaii Macadamia Nuts Final Season Estimates Reports.

Table 7: Compilation of Hawaii Local Agricultural Production (2007 – 2016)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Hawaii Tropical Fruits and Specialties (pounds)	2,280,000	2,050,000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,429,510
Hawaii Vegetable and Melon Crops [1] (pounds)	N/A [1]	N/A [1]	N/A [1]	N/A [1]	41,640,000	43,420,000	52,428,000	44,045,000	49,340,000	49,730,000
Aquaculture (pounds)	1,211,000	918,000	877,000	746,000	540,000	N/A	N/A	N/A	N/A	N/A
Coffee [2,3] (pounds)	7,500,000 [2]	8,700,000 [2]	8,700,000 [2]	8,800,000 [2]	7,600,000 [2]	N/A	N/A	7,500,000 [3]	7,600,000 [3]	7,900,000 [3]
Macadamia Nuts (pounds)	41,000,000	50,000,000	42,000,000	40,000,000	49,000,000	44,000,000	41,000,000	46,000,000	47,000,000	42,000,000
Cattle (raw meat) (pounds)	10,000,000	10,800,000	10,200,000	10,700,000	10,600,000	10,100,000	9,200,000	9,200,000	8,700,000	8,400,000
Milk (pounds)	36,000,000	18,500,000	21,300,000	25,300,000	27,400,000	28,400,000	29,500,000	29,900,000	35,000,000	34,900,000
Hogs & Pigs (pounds)	3,799,000	3,395,000	3,323,000	4,032,000	4,036,000	4,325,000	4,062,000	5,954,000	5,022,000	4,028,000
Taro (pounds)	4,000,000	4,300,000	4,000,000	3,900,000	4,100,000	3,500,000	3,120,000	3,240,000	3,502,000	N/A
Avocados [4] (pounds)	1,160,000 [4]	1,000,000 [4]	1,040,000 [4]	660,000 [4]	700,000 [4]	N/A	640,000 [4]	800,000 [4]	720,000 [4]	960,000 [4]
Bananas (pounds)	25,600,000	17,400,000	18,500,000	17,800,000	17,400,000	N/A	14,500,000	12,000,000	9,060,000	5,550,000
Papayas (pounds)	33,400,000	33,500,000	31,500,000	30,100,000	28,600,000	N/A	24,200,000	23,500,000	25,200,000	19,750,000

NOTES:

(1) 2007-2010 Hawaii Vegetable and Melon Crops are not comparable to 2011-2016, therefore were not included in this report.

(2) 2007-2011 expressed in parchment equivalent pounds. Coffee marketed in cherry form was converted to an equivalent parchment weight and added to parchment marketings.

(3) 2014-2016 measured on cherry-basis.

(4) USDA-NASS measures in tons, to be consistent with other data in this measurement, the tonnage was converted into pounds for this report.

*** Does not include unreported production data. Some production may be unmeasured due to the reduction of agricultural surveyors, a potential cash economy, non-recurring annual statistical surveying data collection, and private residential agricultural production.*

**** Does not include production data of certain commodities to be shown separately to avoid disclosure of individual operations.*

***** Does not include historic sugar production between 2007 and 2016. Local sugar production from Hawaii's sugar industry ended with its last harvest on Dec. 12, 2016.*

Sources: The USDA National Agricultural Statistics Service Hawaii Field Office; USDA 2016 State Agricultural Overview; 2012 USDA Census of Agriculture for Hawaii; 2011 USDA Statistics of Hawaii Agriculture Book; 2017 USDA Hawaii Tropical Fruit and Crops Report; 2013 USDA Hawaii Vegetable and Herb Report; the 2015, 2016, 2017 USDA Hawaii Vegetable and Melon Crops Reports; the 2008, 2009, 2010, 2011, and 2016-2017 USDA Coffee Marketing Estimate Reports; and the 2011-2012, 2016-2017 USDA Hawaii Macadamia Nuts Final Season Estimates Reports.

It is important to note that the agricultural production data do not include all production quantities due to: the reduction of agricultural statistical surveyors, a potential cash economy, non-recurring annual statistical surveying data, and private residential agricultural growth. The data do not measure the amount of locally produced food, which is either consumed locally or exported. Furthermore, this measurement of local agricultural production does not necessarily represent "food" (for example: whether macadamia nuts and coffee yields provide a sustainable food source for the people of Hawaii). By including Figure 14 and Table 7, this report attempts to provide a basic compilation of local agricultural production levels to encourage further discussion of strengthening future policies, planning, and funding to establish an official statewide agricultural baseline of local food production and local food consumption, compared to our agricultural exports.

8. Provide Access to Long-Term Care and Elderly Housing

Considering the increasing pressure on State budgets of institutional long-term care and the increasing inability of most families to plan for paying institutional care costs, the Legislature passed Act 224 in 2008. Act 224 established the Hawaii Long-Term Care Commission which reviewed the breadth of measures possible for funding long-term care in Hawaii.[103] In 2011, the Commission released its final report in response to the legislative directive.

The 2011 report to the Hawaii Long Term Care Commission provides *An Overview of Long-Term Care in Hawaii*.[104] The report found that Hawaii's elderly population is projected to increase significantly over the next two decades. The Hawaii Long Term Care Commission projected an increase in the population aged 65 and older—and particularly people aged 85 and older—will lead to an increase in the number of people needing long-term care.

Table 8: Elderly Population in Hawaii, 2007 and 2030

Population	2007	2030
Total Population 65+	185,622	326,957
Percent of Overall Population	14%	22.3%
Total Population 85+	26,294	48,254
Percent of Overall Population	2%	3.3%

Source: Hawaii Long Term Care Commission Final Report 2011, and American Health Care Association's "The state long-term health care sector, characteristics, utilization, and government funding: 2010 update."

According to the Executive Office on Aging's 2017-2019 Hawaii State Plan on Aging, Hawaii's older adult population (of ages 60 years old and over) continues to increase. The Hawaii State Plan on Aging predicts that by 2020, 1-in-4 residents of Hawaii will be 60 years or older depicted in Table 9.[105]

Table 9: Population Distribution Projections for the United States and Hawaii by Age Groups, 2015 and 2020

Age Group	2015		2020	
	United States [1]	Hawaii [2]	United States [1]	Hawaii [2]
60 years and older	20.8%	23.5%	23.2%	25.8%
60 – 64 years old	5.9%	6.5%	6.3%	6.5%
65 – 74 years old	8.6%	9.6%	9.9%	11%
75 – 84 years old	4.3%	4.8%	5%	5.6%
85 years and older	2%	2.6%	2%	2.7%

Source: 2017-2019 Hawaii State Plan on Aging:
(1) U.S. Census Bureau, (2) Department of Business Economic Development and Tourism

[103] Act 224. Session Laws of Hawaii 2008. (2008). Establishing the Hawaii Long Term Care Commission. Retrieved from: https://www.capitol.hawaii.gov/session2008/bills/SB3255_CD1_.htm.
[104] Hawaii Long Term Care Commission. (2011). An Overview of Long-Term Care in Hawaii, Final Report for the Hawaii Long Term Care Commission. Retrieved from: http://www.publicpolicycenter.hawaii.edu/projects-programs/_long-term-care/RTI_Overview_of_LTC_System-FINAL.pdf.
[105] State of Hawaii, Department of Health, Executive Office on Aging. (2016). 2017-2019 Hawaii State Plan on Aging. Retrieved from: https://www.mediafire.com/file/y6cj61v3276tcbe/ExtensionPlan.pdf.

Although these projections do not necessarily project that the population increase will require long term care and elderly housing, these projections do reveal the increase in Hawaii's aging population, which will increase the demand for home and community-based services. The 2017-2019 State Plan on Aging notes that the growing number of older adults is likely to put a severe strain on the State's resources for and system of long-term supports and services.[106]

One of the goals in the Executive Office on Aging's 2017-2019 State Plan on Aging describes the need to develop "a statewide Aging and Disability Resource Center (ADRC) system for older adults and their families to access and receive long-term services and supports within their counties" (Goal 3, p. 24). To fulfill this goal, the Executive Office on Aging plans to have a statewide fully functioning ADRC. This ADRC is a system that provides older adults and their caregivers and persons with disabilities with a single access point to information on the full range of long-term support and benefits.[107] The ADRC began in 2006 through various grant funding awarded to the Executive Office on Aging and was adopted by the State Legislature in 2013 by codifying the ADRC into §349-31 of the Hawaii Revised Statutes.[108]

Long-term care comprises a range of services from licensed skilled nursing services to homemaker and chore services. The major service types discussed below are used primarily by older people and younger persons with physical disabilities.

The Hawaii Long Term Care Commission's 2011 report noted that in 2010, Hawaii had 48 nursing homes with 4,191 beds certified to participate in Medicare or Medicaid.[109] A total of 3,889 individuals resided in these nursing facilities in 2010.[110]

Nursing Home Facilities

Hawaii has a much lower supply of nursing home beds relative to its elderly population than other states. In 2009, Hawaii had 43.4 nursing home beds per 1,000 persons aged 75 and older, compared to the national average of 88.9 nursing home beds per 1,000 persons aged 75 and older.[111] Between 1997 and 2009, the nursing bed/population ratio declined, both nationally and in Hawaii.[112]

The Hawaii Long Term Care Commission's 2011 report provided possible explanations of this decline between the nursing bed and population ratio is the high amount of three-generation households in the state combined with a strong tradition of informal caregiving has resulted in low demand for nursing home care. Another explanation is that the high cost of real estate and construction needed to expand existing facilities or build new ones constrains the number of nursing home beds.[113]

[106] State of Hawaii, Department of Health, Executive Office on Aging. (2016). 2017-2019 Hawaii State Plan on Aging. Retrieved from: https://www.mediafire.com/file/y6cj61v3276tcbe/ExtensionPlan.pdf.
[107] State of Hawaii, Department of Health, Executive Office on Aging. (2016). Report to the 2017 State Legislature. Retrieved from: http://health.hawaii.gov/opppd/files/2016/10/Act-138-EOA-Annual-Report-111416.pdf.
[108] Hawaii Revised Statutes §349-31. (2012). Aging and Disability Resource Centers Program. Retrieved from: https://www.capitol.hawaii.gov/hrscurrent/Vol07_Ch0346-0398/HRS0349/HRS_0349-0031.htm.
[109] American Healthcare Association. (2010). LTC stats: Nursing facility operational characteristics report: September 2010 Update. Washington, DC: American Health Care Association. Retrieved from: http://www.ahcancal.org/research_data/oscar_data/Nursing%20Facility%20Operational%20Characteristics/OperationalCharacteristicsReport_Sep2010.pdf.
[110] Hawaii Long Term Care Commission. (2011). An Overview of Long-Term Care in Hawaii, Final Report for the Hawaii Long Term Care Commission. Retrieved from: http://www.publicpolicycenter.hawaii.edu/projects-programs/_long-term-care/RTI_Overview_of_LTC_System-FINAL.pdf.
[111] Ibid.
[112] Ibid.
[113] Ibid.

Reflecting upon the high cost of nursing homes in Hawaii, in 2010, 70% of Hawaii's nursing home residents were eligible for Medicaid compared to the national average of 63.6%.[114] Moreover, the Hawaii Long Term Care Commission's 2011 report explained that fewer Hawaii nursing home residents have their care covered by Medicare: 9.2% of residents in Hawaii compared to 14.2% for the nation as a whole.[115] A total of 20.9% of residents in Hawaii paid out of pocket or through another payer compared to 22.2% of residents for the country as a whole.[116]

Hawaii has a very complex system of community-based residential care settings. These include Adult Residential Care Homes (ARCHs), Expanded ARCHs, Community Care Foster Family Homes (CCFFHs), and assisted living facilities. Unless specifically licensed or certified to provide a higher level of care, these homes provide room and board, supervision, and limited assistance with personal care and health-related needs.[117]

Adult Residential Care Homes

ARCHs are licensed by the Hawaii Department of Health. In addition to room and board, ARCHs provide limited assistance with ADLs, custodial care, and supervisory oversight. Type I ARCHs care for up to 5 residents in a private home; Type II ARCHs care for 6 or more residents in larger, more institutional settings that may care for as many as 50 to 60 residents.[118] An expanded ARCH is an adult residential facility licensed to admit individuals who require a nursing home level of care. As of November 2017, Hawaii had 207 Type I ARCHs with 931 beds, 36 Type II ARCHs with 493 beds, and 229 expanded ARCHs with 1,132 beds.[119]

Adult Foster Care Homes/ Community Care Foster Family Homes

Adult Foster Care Homes, also known as Community Care Foster Family Homes (CCFFHs) are certified by the Department of Health to serve both private pay residents and Medicaid-eligible residents who meet nursing home level-of-care criteria as certified by a physician. As of November 2017, there were 1,166 facilities with a capacity of 2,874 beds.[120]

Assisted Living Facilities

Assisted living facilities are licensed and regulated by the Department of Health. Assisted living facilities differ from other types of residential care facilities in that they are required to provide apartment units. These facilities provide room and board, health care services, and personalized supportive services to meet individual residents' needs. As of November 2017, Hawaii had 17 assisted living facilities with 2,683 units.[121]

[114] Hawaii Long Term Care Commission. (2011). An Overview of Long-Term Care in Hawaii, Final Report for the Hawaii Long Term Care Commission. Retrieved from: http://www.publicpolicycenter.hawaii.edu/projects-programs/_long-term-care/RTI_Overview_of_LTC_System-FINAL.pdf.
[115] Ibid.
[116] Ibid.
[117] Hawaii Long-Term Care Association. (undated). An Overview. Honolulu: Hawaii Long-Term Care Association.
[118] Ibid.
[119] State of Hawaii, Department of Health, Office of Health Care Assurance. (2017). Combined ARCH expanded ARCH Vacancy Report- by Area. Retrieved from: https://health.hawaii.gov/ohca/files/2013/06/Combined-ARCH-Expanded-ARCH-Vacancy-Report-By-Area-11-2017.pdf.
[120] State of Hawaii, Department of Health, Office of Health Care Assurance. (2017). Community Care Foster Homes. Retrieved from: https://health.hawaii.gov/ohca/files/2013/06/Community-Care-Foster-Family-Homes-11-2017.pdf.
[121] State of Hawaii, Department of Health, Office of Health Care Assurance. (2017). Assisted Living Facilities. Retrieved from: https://health.hawaii.gov/ohca/files/2013/06/Assisted-Living-Facilities-11-2017.pdf.

Aging in Place

By focusing on preventive services rather than treating only advanced health needs, aging-in-place service providers can also help seniors maintain independence at home, avoid nursing home admission, reduce hospitalization, and minimize social isolation. Studies show that those who choose to age at home have better health outcomes while incurring significantly lower health costs than those who age in nursing homes.[122, 123] In addition to saving financial resources, aging in place is popular among seniors: a full 90% of American seniors share the desire to remain in their homes as they age.[124]

The relatively low supply of nursing home beds in Hawaii has several consequences. In the last 2010 U.S. Census, Hawaii had about 204,700 people over the age of 65. The American Health Association estimated in 2013 that about 12% of Hawaii's senior population, or 23,750 will need long-term care.[125] A 2013 *Caring for Our Kupuna* study produced by the Hawaii Community Foundation warned that with only 4,000 spaces available in nursing homes and 7,000 in residential care homes, approximately 12,750 kupuna who needed long-term care in 2013 were unable to age in a residential facility.[126] The *Caring for our Kupuna* study, estimated that nearly 40,000 kupuna will need long-term care in 2030, shown in Figure 15. The study concluded that Hawaii's facilities would be able to serve only 30% of the 38,000 older adults projected to need long-term care in 2035.[127]

The State Executive Office on Aging's 2017-2019 State Plan on Aging identifies strategies and target dates to coordinate services for older adults to receive care in the comfort of their homes instead of an institution. The Executive Office on Aging stresses the importance that older adults need to be provided with access to high-quality long-term services and supports, such as adult day care, assisted transportation, attendant care, case management, home-delivered meals, and personal care. Finally, this State Plan on Aging identifies improvements for the quality of care for Hawaii's older adults from potential abusive or neglectful in-home support through the Hawaii's Long-Term Care Ombudsman Program.

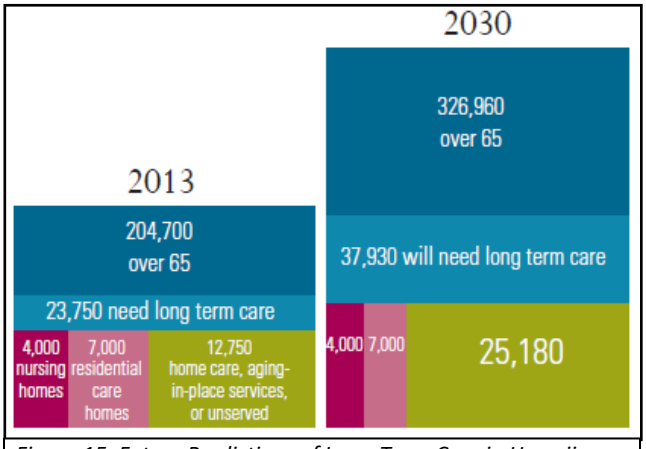

Figure 15. Future Predictions of Long-Term Care in Hawaii. Courtesy: Hawaii Community Foundation, Caring for Our Kupuna Study.

[122] Marek, K. D., Popejoy, L., Petroski, G., Mehr, D., Rantz, M., & Lin, W.-C. "Clinical Outcomes of Aging in Place." Nursing Research 54.3 (2005): 202-11.
[123] Marek, K D., F Stetzer, S J. Adams, L L. Popejoy, and M Rantz. "Aging in place versus nursing home care: comparison of costs to Medicare and Medicaid." Research in Gerontological Nursing 5.2 (2012): 123-29.
[124] AARP Policy Institute. (2011). Aging in Place: A State Survey of Liveability Policies and Practices. Retrieved from: https://assets.aarp.org/rgcenter/ppi/liv-com/aging-in-place-2011-full.pdf.
[125] American Healthcare Association. (2013). Trends and Statistics. Retrieved from: http://www.ahcancal.org/research_data/trends_statistics/Pages/default.aspx.
[126] Hawaii Community Foundation. (2013). Caring for Our Kupuna Study. Retrieved from: https://www.hawaiicommunityfoundation.org/file/pdfs/Caring-for-Our-Kupuna-Study.pdf.
[127] American Healthcare Association. Nov 2010. The State Long-Term Healthcare Sector: Characteristics, Utilization, and Government Funding: 2010 Update.

9. Preserve and Perpetuate our Kanaka Maoli and Island Cultural Values

The 2008 Hawaii 2050 Sustainability Plan explained that Hawaii's ethnic diversity and multi-culturalism have contributed significantly toward making our state unique. The Hawaii 2050 Sustainability Plan's "where are we now" measurement explained that no data of this information was compiled and suggested that an annual population survey could be conducted to measure this activity. The Hawaii 2050 Sustainability Plan's "2020 Suggested Benchmark" was that Hawaii residents should attend a cultural event at least once a quarter by 2020.

Unfortunately, due to the lack of a permanent government sustainability coordinating entity over the previous decade, it is difficult to measure whether there has been an increase of Hawaii residents' attendance at cultural events on a quarterly basis over the past ten years. The Hawaii Tourism Authority does commission a resident study, most recently completed in 2015. It would have been most effective for this resident study to include a question on resident attendance at cultural events, as there are other questions pertaining to sustainability in the 2015 study.[128]

Additionally, the Hawaii Tourism Authority (HTA) funds the County Product Enrichment Program (CPEP) in partnership with each of the four counties of Hawaii. These are programs that are initiated by the community and supported by HTA which showcase the unique and diverse experiences available for resident and visitor attendance across the Hawaiian Islands. In 2018 HTA funded 124 programs statewide through their community enrichment program, aloha 'āina program, and kukulu ola program.[129]

Thanks to many initiatives over this past decade, efforts to preserve and protect the Kanaka Maoli and Hawaii's cultural values has progressed. The Hawaii 2050 Sustainability Plan also called for the establishment of intellectual property right laws and created an indictor under Goal 5, Indicator 5.6 to measure the number of intellectual property laws passed over the last decade.

Although no intellectual property laws protecting and preserving the Native Hawaiian culture were enacted during the study period of this report (2008-2017), this report found other noteworthy laws were passed as significant cultural laws strengthening the importance of including Hawaii's Lāhui Kānaka and advancing the preservation of Hawaii's cultural values in government.

[128] State of Hawaii, Hawaii Tourism Authority. (2016). 2015 HTA Resident Sentiment Study. Prepared by: QMark Research. Retrieved from: http://www.hawaiitourismauthority.org/default/assets/File/reports/2015%20Resident%20Sentiment.pdf.
[129] State of Hawaii, Hawaii Tourism Authority. (2017). 2018 Community Enrichment Program. Retrieved from: http://www.hawaiitourismauthority.org/default/assets/File/Community%20Programs%202018.pdf.

Noteworthy Hawaiian Cultural Laws Enacted (2008-2017):

- **Act 210 (2010)**[130]**:** Prevents the loss of Hawaiian fishponds, a valuable cultural resource and encourages their restoration and preservation by prohibiting the sale of public lands on which government-owned Hawaiian fishponds are located.
- **Act 107 (2011)**[131]**:** Required the Department of Health to adopt rules in order to recognize the preparation of poi and pa'i 'ai using traditional Hawaiian cultural food preparation practices.
- **Act 195 (2011)**[132]**:** Recognized the Native Hawaiian people as the only indigenous, aboriginal, Maoli people of Hawaii as well as established a Native Hawaiian roll to build Hawaiian identity and representation within government.
- **Act 210 (2011)**[133]**:** Protected the He'eia community development district to develop culturally appropriate agriculture, education, and natural-resource restoration and management of the He'eia wetlands.
- **Act 4 (2013)**[134]**:** Added a member possessing a background in Native Hawaiian traditional and customary practices on the DLNR-Natural Area Reserves System Commission.
- **Act 104 (2014)**[135]**:** Required that at least one member of the board of land and natural resources, other than the member appointed for having a background in conservation and natural resources, have demonstrated expertise in Native Hawaiian traditional and customary practices.
- **Act 169 (2015)**[136]**:** Required Office of Hawaiian Affairs to administer a training course on Native Hawaiian and Hawaiian rights. Required members of certain State councils, boards, and commissions to attend the training course.
- **Act 171 (2015)**[137]**:** Decriminalized traditional Hawaiian burial practices.
- **Act 31 (2015)**[138]**:** Updated the State's agricultural objectives to include the perpetuation, promotion, and growth of traditional Hawaiian farming methods and crops, as well as the growth and development of small scale farms.
- **Act 230 (2015)**[139]**:** Waived the DOH water quality certification requirement for restoration, repair, and operation of Hawaiian loko i'a (fishponds).
- **Act 72 (2016)**[140]**:** Appropriated funds to the Kaho'olawe Island Reserve Commission for restoration and preservation projects. Required submission of a financial self-sufficiency and sustainability plan to the Legislature.

[130] Act 210, Session Laws of Hawaii. (2010). Hawaii Revised Statutes §171-28. Government-owned Hawaiian fishponds; sale prohibition. Retrieved from: https://www.capitol.hawaii.gov/hrscurrent/Vol03_Ch0121-0200D/HRS0171/HRS_0171-0028.htm.
[131] Act 107, Session Laws of Hawaii. (2011). Hawaii Revised Statutes §321-4.7. Producers of hand-pounded poi; exemption. Retrieved from: https://www.capitol.hawaii.gov/hrscurrent/Vol06_Ch0321-0344/HRS0321/HRS_0321-0004_0007.htm.
[132] Act 195, Session Laws of Hawaii. (2011). Hawaii Revised Statutes §10H. Native Hawaiian Recognition. Retrieved from: https://www.capitol.hawaii.gov/hrscurrent/Vol01_Ch0001-0042F/HRS0010H/HRS_0010H-.htm.
[133] Act 210, Session Laws of Hawaii. (2011). Hawaii Revised Statutes §206E, Part VIII. Heeia Community Development District. Retrieved from: https://www.capitol.hawaii.gov/hrscurrent/Vol04_Ch0201-0257/HRS0206E/HRS_0206E-0201.htm.
[134] Act 4, Session Laws of Hawaii. (2013). Hawaii Revised Statutes §195-6. Retrieved from: https://www.capitol.hawaii.gov/session2013/bills/HB941_.pdf.
[135] Act 104, Session Laws of Hawaii (2014). Hawaii Revised Statutes §26-15. Retrieved from: https://www.capitol.hawaii.gov/session2014/bills/HB1618_CD1_.pdf.
[136] Act 169, Session Laws of Hawaii. (2015). Hawaii Revised Statutes §10, Part III. Retrieved from: https://www.capitol.hawaii.gov/hrscurrent/Vol01_Ch0001-0042F/HRS0010/HRS_0010-0041.htm.
[137] Act 31, Session Laws of Hawaii. (2015). Hawaii Revised Statutes §711-1108. Retrieved from: https://www.capitol.hawaii.gov/session2015/bills/SB434_HD1_.pdf.
[138] Act 31, Session Laws of Hawaii. (2015). Hawaii Revised Statutes §226-7. Retrieved from: https://www.capitol.hawaii.gov/session2015/bills/SB434_HD1_.pdf.
[139] Act 230, Session Laws of Hawaii. (2015). Hawaii Revised Statutes §342D-6.5. Hawaiian Loko i'a. Retrieved from: https://www.capitol.hawaii.gov/session2015/bills/HB393_SD2_.pdf.
[140] Act 72, Session Laws of Hawaii. (2016). Appropriating the Kahoolawe Island Reserve. Retrieved from: https://www.capitol.hawaii.gov/session2016/bills/HB2034_CD1_.pdf.

Polynesian Voyaging Society and Mālama Honua

The Polynesian Voyaging Society led Hawaii and the World in the recognition of Native Hawaiian and Polynesian historical cultural practices. Polynesian voyaging was near extinction when, in the 1970s, a group of traditional navigators, scientists, and explorers founded the Polynesian Voyaging Society to revive traditional wayfinding and exploration. After decades of voyaging, the Polynesian Voyaging Society embarked on their Polynesian double-hulled voyaging canoes, Hōkūleʻa and Hikianalia, from Oahu for their "Mālama Honua" voyage in 2014 for a three year circumnavigation of the Earth to bring global attention to the need to take care of our Island Earth. Mālama Honua has allowed the Polynesian Voyaging Society to collect stories of hope from around the world, including how indigenous communities in Hawaii and elsewhere are turning to traditional practices to reverse the environmental damage caused by human activity. The Polynesian Voyaging Society's mission through Mālama Honua sought to engage communities worldwide in practicing how to live sustainability while sharing the Polynesian culture, learning from the past and from each other, creating global relationships, and inspiring action to care for our Island Earth. After Hōkūleʻa and Hikianalia returned to Hawaii, they launched their "Mahalo, Hawaii Sail" in August 2017 to mahalo and mālama the people of Hawaii.

2018 as the Year of the Hawaiian

Most recently the 2017 State Senate passed Senate Resolution 74, requesting the Governor to proclaim and designate June 1, 2018 - June 1, 2019 as the "Year of the Hawaiian" and requesting the Office of Hawaiian Affairs to study and recommend to the Legislature a plan to celebrate the 2018 and 2019 as the "Year of the Hawaiian."[141] The senate resolution highlighted that 2010 U.S. Census data indicated that there were a total of 527,077 Native Hawaiians living in the United States, with 289,970, or 55%, living in Hawaii, which comprises 21.3% of Hawaii's total population.[142] The resolution further highlighted that 2013 U.S. Census data indicated that the Native Hawaiian population is expected to double before 2050.[143]

Growth in Native Hawaiian Community

There has been a substantial growth in Native Hawaiian charter schools so that 15 of the existing 31, or 48%, of the State charter schools are now Native Hawaiian focused, which participate as part of the Native Hawaiian Charter School Alliance known as Nā Lei Naʻauao, and are learning communities that are pedagogically aligned in unique and various ways with Native Hawaiian culture, language, traditions, and values.[144]

The Hawaiian Benevolent Royal Societies origins are rooted in the legacies of Hawaiian Aliʻi such as the Royal Order of Kamehameha originating in 1865,[145] the Kaʻahumanu Society founded in 1905,[146] the Mamakakaua Daughters and Sons of Hawaiian Warriors (originally formed as Daughters of the Warriors in 1911),[147] and Hale O Nā Aliʻi O Hawaii formed in 1918.[148] Finally, in 2003, a hui called the ʻAha Hipuʻu formed, comprised of these four royal societies, to continue to ensure that Native Hawaiians maintain a connection to their unique Native Hawaiian heritage, history, and tradition.[149]

[141] Hawaii State Senate. (2017). Senate Resolution 74. Retrieved from:http://www.capitol.hawaii.gov/session2017/bills/SR74_SD1_.pdf.
[142] Ibid.
[143] Ibid.
[144] Na Lei Naauao, Native Hawaiian Charter School Alliance. (2017). Retrieved from:http://www.kalo.org/apps/pages/index.jsp?uREC_ID=209524&type=d&pREC_ID=465138.
[145] Royal Order of Kamehameha. (2017). Retrieved from: http://www.mamalahoa.org/kamehameha/royal-order-of-kamehameha-i/.
[146] Ahahui Kaahumanu. (2017). Retrieved from: http://www.kaahumanu.org/.
[147] Aha Hipuu. (2017). Background of the Aha Hipuu. Retrieved from: http://www.ahahipuu.org/about/.
[148] Ibid.
[149] Ibid.

Hawaiian homestead community organizations were formed by various homestead community members to advance the economic and social improvement of the residents living within these Hawaiian homestead communities and, of the 30 then- existing homestead associations, 19 joined together in 1987 to form the Sovereign Council of the Hawaiian Homestead Assembly (formerly the State Council of the Hawaiian Homelands Assembly). This Council continues today representing 35 of the 48 existing homestead communities. The Association of Hawaiian Civic Clubs, established in 1918, grew over the years to 58 chapters located on the four islands of Oahu, Hawaii, Maui, and Kauai, as well as on the mainland, and continues to maintain an active and growing presence to address the needs of Native Hawaiians.[150]

Major events including the Aloha Lili‘u Ceremony, provided the opportunity for a centennial observance honoring Hawaii’s last reigning monarch, Queen Lili‘uokalani’s life and legacy. This noteworthy ceremony honored the Queen on the centennial anniversary of her death on November 11, 2017, showing that one hundred years later, the people of Hawaii continue to feel the loss of a leader and one of the most influential women in Hawaii history.[151]

Native Hawaiians have raised the consciousness throughout Hawaii of the importance of Aloha ‘Āina - loving, caring, respecting, and honoring the precious and fragile lands, seas, and stewardship to Pae‘aina o Hawaii, which led to significant policies and programs to protect the sustainability of Hawaii's natural resources. Despite these strides made to preserve and protect the Kanaka Maoli and Hawaii’s cultural values, Hawaii continues to struggle with the Native Hawaiian principles and practices of aloha ‘āina and cultural literacy of mo‘olelo, recognizing the sacred and cultural significance of Hawaii’s land.

As Sen. Kenny Brown explained in his landmark speech on the “Mālama Ethic” during a July 25, 1973 seminar titled *The Spectrum of Influences Affecting Quality Growth*.[152] His advice in the planning for Hawaii’s future included:

> First, carry on all the transactions you want with the outside world, but protect the land, the beasts, the plants, the insects and the rest, for only by exporting their produce can you pay for the purchases you make. Second, multiply, if you will, within the limits of productivity, but have infinite care where you put your houses, harbors, and hotels, because you must protect your land’s natural beauty and spirit of place if you are to retain and sustain your own spirit. (Brown, 1973, para. 16)

Heeding such advice is more important today than when it was first offered in 1973; however, most important of his Mālama Ethic, Sen. Kenny Brown reminds us that the transactions we face must meet the test of mālama, at all times, without exception, as he describes:

> All of man’s acts in Hawaii must be dominated by the spirit of “Malama.” Because he knows so many ways to destroy his natural environment, man must now become its custodian and caretaker for his own sake. He must exercise malama, because if he starts selling parts of his natural environment abroad for creature comforts, he will lose it all, and be unable to survive here. If he uses up his landscapes, mountains, valley and vistas, or if he degrades his air and waters, he will destroy the beauty and hence the spirit of Hawaii, and in so doing, his own spirit. Malama, is thus an imperative. It is applicable to our entire lives in Hawaii. It is applicable to all our transactions with each other, to all of our transactions with the overseas world, and to all of the transactions between society and nature. **Each of these transactions must meet the test of malama, at all times, without exception**. [Emphasis added] (Brown, 1973, para. 17)

As an island-community, Hawaii, grew to recognize the significance of its indigenous culture. Hawaii’s ancestors relied on sustainable practices to mālama Hawaii, and we can continue to strive to achieve this balance of sustainability protecting our economic interests, environmental resources, and social and cultural values.

[150] The Association of Hawaiian Civic Clubs. (2017). Retrieved from: http://www.aohcc.org/index.php/en/.
[151] The Queen Liliuokalani Trust. (2017). Aloha Lili‘u: Honoring the Queen’s Life and Legacy. Retrieved from: http://onipaa.org/pages/aloha-lili-u-honoring-the-queen-s-life-legacy.
[152] Brown, K. 1973. “Malama” before the seminar titled “The Spectrum of Influences Affecting Quality Growth”. Retrieved from: http://archive.hokulea.com/index/founder_and_teachers/kenny_brown.html.

Recommendation 2: Establish a Sustainability Council

The 2008 Hawaii 2050 Sustainability Plan recommended that an implementing entity (i.e.: the Sustainability Council) be established to implement Hawaii's sustainability goals. The intent was that this Sustainability Council would be a non-regulatory government body to be in charge of coordinating, marketing, and implementing the Hawaii 2050 initiatives and recommendations. The plan explained that similar in concept to the State's Council on Revenues, this Sustainability Council would help promote sustainability, determine intermediate and long-term benchmarks, measure success, coordinate cross-sector efforts and dialogue, and report to government and private sector leaders on progress.

Over the past ten years, however, the Sustainability Council was never established. Instead, a temporary State Sustainability Coordinator position was created in 2013, as a cabinet-level position in the Governor's office with the purpose to work across departments, with local governments, federal agencies, communities, the private sector, and with non-governmental organizations to advance integrated policies, programs, and projects for urban and rural sustainable development and resilience. This position worked with the State Legislature to develop the legislative resolution endorsing and supporting the *Aloha+ Challenge: a Culture of Sustainability*, which established six targets focusing on clean energy, local food, natural resource management, waste reduction, smart sustainable communities, and green workforce.[153] This legislative resolution required the State's Sustainability Coordinator to submit a report to the 2015 Legislature on the launch of the Aloha+ Challenge, including recommendations for promoting action and tracking progress on statewide sustainability targets.[154]

The temporary State Sustainability Coordinator position in the Governor's office diminished in 2015. Later in 2016, another State Sustainability Coordinator position was established within the Office of Planning and was filled in 2017 to implement the sustainability priority guidelines within the Hawaii State Planning Act (HRS § 226-108).[155] The position was tasked to serve as a sustainability liaison among state and other governmental agencies, as well as private or non-profit organizations, on various sustainability initiatives being performed statewide.

In order to support the vision of the Hawaii Sustainability 2050 Plan, policies must be enacted to:

- Codify a sustainability framework within the Hawaii Revised Statutes.
- Create a permanent sustainability program or office within the State of Hawaii.
- Define the sustainability program with staff and definitions of the program's responsibilities and authorities.
- Fund the sustainability program to ensure statewide implementation.
- Fund the update of the ten year update of the 2008 Hawaii 2050 Sustainability Plan.

[153] S.C.R. 69, S.D.1, 27th Leg., Reg. Sess. (Haw. 2014).
[154] State of Hawaii, "Report to the 28th Legislature, 2015 Regular Session, Aloha+ Challenge: Recommendations for Taking Action and Tracking Progress," December 2014.
[155] Sustainability Priority Guidelines, Hawaii State Planning Act, Hawaii Revised Statutes §226-108 (2011). Retrieved from: https://www.capitol.hawaii.gov/hrscurrent/Vol04_Ch0201-0257/HRS0226/HRS_0226-0108.htm.

Recommendation 3: Develop Sustainability Indicators

Although no Sustainability Council was created as recommended in the 2008 Hawaii 2050 Sustainability Plan, multiple efforts were made to establish a Sustainability Coordinator within government to assist the State of Hawaii with the implementation of its sustainability goals and policies.

The Hawaii 2050 Sustainability Plan set forth this recommendation by explaining that the Hawaii 2050 indicators would be an annual aggregation of the data to measure whether Hawaii is making progress toward these Hawaii 2050 goals. The plan explains that the "Hawaii 2050 indicators will be the primary measure of the overall progress of our society. There are 55 recommended indicators to measure Hawaii's overall economic, environmental, community and cultural characteristics." (Hawaii 2050 Sustainability Plan, p.3)

If funding is provided to formally update the State of Hawaii's 2050 Sustainability Plan, these indicators should be updated to modernize and appropriately measure the goals established in the Hawaii 2050 Sustainability Plan.

Recommendation 4: Report on Progress

This report will show that some of the Hawaii 2050 Sustainability Plan's 55 indicators have been implemented, while others have not. Moreover, this report will display that some of the 55 indicators will describe a narrative while other indicators can be measured through metrics. Due to the lack of a permanent government sustainability entity, however, these 55 indicators were not consistently monitored over the past ten years.

This final recommendation provided by the Hawaii 2050 Sustainability Plan explained that the Sustainability Council would produce an annual report card measuring these goals and objectives to be presented to government and other leaders.

Due to the lack of a permanent government sustainability entity, whether a Sustainability Council or a Sustainability Coordinator, there is no official record of an annual report card measuring the Hawaii 2050 Sustainability Plan's goals and objectives. This report will serve as the first attempt to measure the five goals and nine "2020 benchmarks" based off of the Hawaii 2050 Sustainability Plan's 22 strategic actions and 55 indicators.

Assessment of the Hawaii 2050 Sustainability Goals, Strategic Actions, and Indicators

The Hawaii 2050 Sustainability Plan identified five goals as the integrated philosophies that express the sustainable future of Hawaii to reflect a sense of where Hawaii should be headed. In order to measure the implementation of these five goals, the Hawaii 2050 Sustainability Plan identified 22 strategic actions and 55 indicators. This report attempts to measure these five goals based off of the 2008 Hawaii 2050 Sustainability Plan's 22 strategic actions and 55 indicators.

Goal 1: Sustainability as a Way of Life

The primary goal of the Hawaii 2050 Sustainability Plan was that "by 2050, our goal is that sustainability will be a way of life for all Hawaii residents, not a technical term used by environmentalists, planners, and political leaders. Integrating this ethic cannot be confined to government policy, but rather it is a fundamental shift in our understanding of our economy, society, and environment."

The plan explained that government must lead and set an example as the largest employer and consumer in the state. The plan described that through the government's actions and policies, dramatic shifts on whether we meet our sustainable future, including retrofitting old facilities, purchasing hybrid cars, and buying biodegradable products. To measure these three strategic actions based off of the goal of establishing sustainability as a way of life, the Hawaii 2050 Sustainability Plan provided nine indicators.

STRATEGIC ACTIONS

1. **Develop a sustainability ethic.**
2. **Conduct ongoing forums and cross-sector dialogue to promote collaboration and progress on achieving Hawaii's sustainability goals.**
3. **Continually monitor trends and conditions in Hawaii's economy, society, and natural systems.**

NINE INDICATORS:

1. **Percentage of all schools that have adopted sustainability modules.**
2. **Percentage of residents understanding and supporting sustainability practices.**
3. **Per capita water consumption.**
4. **Per capita energy consumption.**
5. **Percentage of renewable and alternative energy.**
6. **Percentage use of solar or other alternative water heating sources.**
7. **Number of government, business, labor and community organizations that adopt sustainability practices and policies.**
8. **Percentage of new cars purchased that use renewable fuel technology.**
9. **Percentage of households participating in recycling.**

Summary of Progress toward the "Sustainability as a Way of Life" Strategic Actions and Indicators:

The Hawaii 2050 Sustainability Plan's first goal, to integrate sustainability as a way of life, has generally progressed over the past decade; however, according to these indicators, this progress is largely in thanks to external sustainability community groups advocating for farm to school initiatives, zero waste initiatives, recycling initiatives, and clean energy initiatives. Hawaii made significant progress toward our clean energy goals thanks to the legislation establishing the Hawaii Clean Energy Initiative. The following recommendations are areas within this goal that need strengthening toward a successful sustainable future:

- **Hawaii's Fresh Water Security Needs Strengthening**

The American Planning Association (APA) recently recognized that water resource issues should be accepted as highly interrelated with land development. Population and employment growth increased demands on scarce water supplies. Pollution and water disposal practices have also diminished the quality and availability of water. Emerging issues such as climate change, urban population growth, and the challenges posed by our aging water service systems have given the rise to the demand for new solutions for water services. Due to these challenges, the APA has recommended the concept of "One Water" management as a foundational paradigm for water sustainability planning. One Water is based on the idea that all water is interconnected and is most effectively and sustainably managed using an integrated approach.[156]

The Hawaii Fresh Water Initiative, organized by the Fresh Water Council of the Hawaii Community Foundation, includes diverse forward-thinking parties who have a deep-knowledge of Hawaii's water. This Fresh Water Council authored the *Blueprint for Action: Water Security for an Uncertain Future (2016-2018)*, which provides policy recommendations for decision-makers to adopt between the years of 2016 and 2018 to put Hawaii on a path toward water security. The Blueprint presents a statewide goal of 100 million of gallons per day (MGD) in additional fresh water capacity and focuses on three aggressive water strategy areas and individual targets that the public and private sectors must work together to achieve by 2030 [157]:

- **Conservation**: Improve the efficiency in how water is transported and used so that each Hawaii resident requires 15% less water per capita to meet our needs.
- **Recharge**: Increase Hawaii's ability to capture rainwater in key aquifer areas by improving stormwater capture and nearly doubling the size of our actively protected watershed areas. By 2030, this goal will provide 30 MGD in increased water availability.
- **Reuse**: More than double the amount of wastewater currently being reused in the state to 50 MGD. By 2030, this goal will provide an additional 30 MGD in increased water availability.

Adopting the policies recommended in the *Blueprint for Action* will help advance Hawaii's water security initiatives. Formally establishing a Hawaii Fresh Water Initiative through legislation, similar to the Hawaii Clean Energy Initiative, can better coordinate water security policies and projects to improve Hawaii's sustainable water future.

- **Hawaii's Recycling Efforts Needs Stronger Coordination**

The State of Hawaii has many recycling laws and goals within the Hawaii Revised Statutes, yet decades after these laws' enactment, Hawaii continues to struggle with its recycling efforts, laws like Hawaii's ADF glass law and Hawaii's HI-5 law, compete against each other. Incinerating waste to create clean energy can also contradict Hawaii's recycling goals, and could lead to the justification of potentially incinerating recyclables. Stronger direction and delineation between these goals is needed.

[156] American Planning Association. (2017). PAS Report: Planners and Water. Retrieved from: https://www.planning.org/publications/report/9131532/.
[157] Hawaii Community Foundation, Hawaii Freshwater Initiative. (2016). A Blueprint for Action: Water Security for an Uncertain Future (2016-2018). Retrieved from: https://www.hawaiicommunityfoundation.org/strengthening/fresh-water.

Measurements of Indicators:

1.1 Percentage of All Schools That Have Adopted Sustainability Modules:

Unfortunately, due to the lack of a permanent government sustainability coordinating entity, the percentage of schools throughout Hawaii adopting sustainability modules was not monitored over the past decade. This report, however, will highlight the amount of several sustainability initiatives at the individual school-level.

Since the Hawaii 2050 Sustainability Plan was published, the Department of Education (DOE) made several concerted efforts not only to improve public education in the state, which is the department's primary jurisdiction, but has, through several parallel efforts, attempted to incorporate sustainable practices into the way it does business. These efforts range from pilot projects and focused data gathering in the Office of School Facilities and Support Services to the development of curriculum on different areas of conservation and sustainability and an emphasis on Nā Hopena A'o, which is a DOE-wide framework to develop the skills, behaviors, and dispositions that are reminiscent of Hawaii's unique context, and to honor the qualities and values of the indigenous language and culture of Hawaii.

The DOE's energy sustainability project, Ka Hei, includes a curriculum program that, since Ka Hei's launch in 2014, has grown to include 184 participating schools.[158] The Ka Hei curriculum program is aligned with Hawaii Common Core and Next Generation Science Standards and builds upon STEM (science, technology, engineering, and math) opportunities in classroom.[159] To date, 1,153 educators have been involved with Ka Hei-related professional development sessions or activities and 47 professional development sessions have been completed statewide.

The Ka Hei curriculum program is organized around themes to prepare students to be community stewards and activities are designed to nurture the ongoing development of interpersonal skills to support students' future success. The curriculum program began with solar and energy efficiency kits and living laboratories for grades 5-9 and has expanded to include additional grades.

In addition to Ka Hei, several DOE schools have partnered with community stakeholders to engage in projects that promote sustainability and sustainable practices. These include:

Keoneula Elementary Garden

Keoneula's Outdoor Learning Center includes a native Hawaiian garden, including taro, sweet potato, and native flora (including medicinal plants); a worm bin for green composting; and an aquaponics system. The school has been working with community partners, including Prudential Locations Foundation, HECO, and families and neighbors to expand this project and more easily integrate it into the school's curriculum.[160]

[158] State of Hawaii, Department of Education. (2017). Ka Hei Program. Retrieved from: http://www.hawaiipublicschools.org/ConnectWithUs/Organization/SchoolFacilities/Pages/Ka-Hei.aspx.
[159] State of Hawaii, Department of Education. (2017). Ka Hei Program Curriculum. Retrieved from: http://www.hawaiipublicschools.org/VisionForSuccess/SuccessStories/Partners/Pages/KaHeiCurriculum.aspx.
[160] State of Hawaii, Department of Education. (2013). Community Kokua Makes Keoneula Elementary Garden, Learning Center, a Reality. [blog post]. Retrieved from: http://www.hawaiipublicschools.org/VisionForSuccess/SuccessStories/Volunteers/Pages/Keoneula-Elementary-Outdoor-Learning-Center.aspx.

Mākaha Elementary School

Mākaha Elementary School is located right next to Hoa ʻĀina O Mākaha, a 501(c) (3) non-profit educational program. In 1987, the then Principal of Mākaha approached former Catholic priest Luigi (Gigi) Cocquio, the owner of the farm, to see if he would be willing to collaborate on a program for the elementary school students. The result was the Na Keiki O Ka ʻĀina (The Children of the Land) Program.[161]

Under Makaha Elementary School's program, one grade a day from the school follows a curriculum planned with the grade-level teachers and aligned to DOE standards. Examples of work that is done include planting various food crops (each grade level has its own plot), exploring science concepts through the care and keeping of the crops, and learning about traditional Hawaiian uses of different flora for specific purposes. In addition, students learn about Polynesian migration, the formation of the islands, and traditional Hawaiian land divisions.
In addition, the students are able to harvest what they've grown and use it at home, completing the farm to table cycle.

Farm to School

Hawaii has an amazing legacy of land cultivation spanning two millennia. Providing meals for Hawaii's next generation grown from the lands on which they live is an approach that at one point in Hawaii's history was the only way to provide meals. Connecting Hawaii's keiki to the "that which feeds" (a literal term for the Hawaiian word ʻāina – land) will grow an understanding and respect for the land with a generation growing farther removed from its utility and capacity.

In 2015, Lt. Governor Shan Tsutsui convened the Hawaii Farm to School Advisory Group to develop a pathway toward bringing fresh, local food to schools statewide to reinforce the vision that Hawaii exists as a perpetual reminder of finite resources, fertile lands and communities who are committed to the wellbeing of their keiki. The Lieutenant Governor's Advisory Group developed the **ʻ**Āina Pono: Hawaii's Farm to Cafeteria Initiative**,** a private-public partnership "expressing the pride we have in food grown in these islands, the ingenuity of the people we trust to feed our keiki and the collective strength to return our communities to a legacy of cultivating fresh, locally grown sustenance to build the minds of tomorrow."[162]

ʻĀina Pono is the Hawaii State Department of Education's (HIDOE) pioneering farm to school pilot initiative that aims to bring more healthy, nutritious, fresh, and local food to school cafeterias throughout Hawaii.

Farm to school encompasses a variety of efforts to connect communities and students to fresh, nutritious food. Farm to school generally includes three core elements:

1. School gardens;
2. Nutrition, agriculture, health, and food education; and
3. The procurement of local foods for school meals.

[161] Hoa ʻĀina O Mākaha. (2017). Na Keiki O Ka ʻĀina Program. Retrieved from:http://www.hoaainaomakaha.org/programs-3/na-keiki-o-ka-aina-children-of-the-land/.
[162] State of Hawaii, Office of the Lieutenant Governor. (2017). Farm to School Initiative. Retrieved from: http://ltgov.hawaii.gov/farm-to-school-initiative/.

The first and second elements aim to help students become "citizen eaters" who understand the connections between food, health, and agriculture. ʻĀina Pono focuses on the third element, which aims to create pathways to include local food in school meals. From improving academic performance, to encouraging healthy food choices, to supporting farmers and the local economy, the benefits of farm to school programs are truly abundant.

ʻĀina Pono has four main goals:

1. **Purchase Local Food**: Systematically increase HIDOE's purchasing of local food for school breakfast, lunch, and snack programs. Target: 40% local food (*i.e.*, grown and/or raised within the State of Hawaii).
2. **Increase Student Participation**: Increase student participation in child nutrition programs, *i.e.*, increase the number of students that eat school meals. Target: participation increases by 5%.
3. **Healthy Foods**: Increase student consumption of healthy foods in school meals. Targets: Processed food shall not exceed 40%; food waste declines by 10%.
4. **Cost-Neutral**: The Initiative will be cost-neutral over time, *i.e.*, implementation costs will be covered by cost- savings generated by decreased waste and increased efficiencies. Target: Overproduction shall not exceed 5%.

The Initiative includes the following components:

- **Menu Development**: Working with cafeteria staff to develop new student-approved recipes that use fresh, locally sourced ingredients and meet USDA guidelines. Cooking with fresh food is integral to sourcing local food in Hawaii due to the unprocessed nature of most local food products.
- **Training**: Training cafeteria staff on production planning, just-in-time production, teamwork, leadership, time management, production records, portion control, local procurement, cooking skills, knife skills, offer vs. serve, waste systems, profit and loss analysis, purchasing/inventory/cost controls, customer service, taste testing, and recordkeeping.
- **Data Tracking**: Developing data tracking systems to track profit and loss, waste, and local procurement.
- **Waste Management**: Developing waste management systems to measure and reduce overproduction (*i.e.*, food that is prepared but not sold) and plate waste (*i.e.*, food that is sold but not eaten).
- **Supply Chain Development**: Meeting with farmers and food distributors to increase the pipeline of local food available to HIDOE.
- **Procurement Innovation**: Working with HIDOE's School Food Services Branch supervisors and procurement contracts branch, Hawaii Child Nutrition Programs, the State Procurement Office, and the USDA to develop innovative procurement approaches that support buying local while complying with state and federal laws.
- **Community Outreach**: Engaging community members throughout the state in the Initiative in order to share information, receive feedback, and encourage students to try new menu items.
- **Nutrition Education**: Providing schoolchildren with nutrition education in school gardens and classroom settings to connect them to the source of their food and expose them to a wide variety of fresh, local foods, including fresh fruits and vegetables.

Additionally, the Hawaii Department of Agriculture's Farm to School Program was established in 2015 through Act 218, codified as §141-11 of the Hawaii Revised Statutes. The Department of Agriculture's Farm to School Program is a participant in the Kohala Center's Hawaii Farm to School and School Garden Hui, which led the Hawaii Farm to School and School Garden Hui Survey in 2012. The School Garden Hui's 2012 Farm to School survey reported there were 168 school learning gardens in Hawaii, reaching 21,557 students with 830 participating teachers and 30 acres of land dedicated to school learning gardens in the 2012 school year.[163]

The Kōkua Hawaii Foundation also works directly with 46 individual public, charter, and private schools throughout Hawaii to promote sustainability-related education focusing on plastic free, recycling, and 'āina program in Hawaii's schools.[164] Since 2006, Kōkua Hawaii Foundation has provided participating schools with their "'Āina in Schools" farm to school initiative teaching children healthy eating habits, nutrition education, garden-based learning, promoting environmental stewardship by connecting children to the land and water that sustains them, waste reduction, and agricultural literacy.[165]

The Kōkua Hawaii Foundation expanded their curriculum resources to schools by providing a "3R's in Schools" school recycling program, where the school makes commitments to reduce, reuse, and recycle on their school campuses.[166] "Plastic Free Hawaii" is another program offered by the Kōkua Hawaii Foundation which provides resources, tools, and trainings to educate schools, business partners, and community members about the environmental and health benefits of going plastic free to minimize single-use plastics in our islands. The program supports communities and schools in coordinating beach clean-ups, film screenings, and trainings to deliver Plastic Free Hawaii educational presentations.[167]

Finally, the Kōkua Hawaii Foundation offers field trip grants and mini-grants for schools to experience hands-on learning about Hawaii's environment, as well as fund projects and teachers from Hawaii schools to assist in advancing their environmental goals in the classroom and pursue stewardship endeavors. During the most recent 2016-2017 school year, Kōkua Hawaii Foundation awarded a total of 164 of Hawaii's schools with mini-grants or field trip grants which supported over 26,000 students.[168] Several DOE schools have partnered with the Kōkua Hawaii Foundation to engage in projects that promote sustainability and sustainable practices in their communities, including:

Mililani Uka Elementary School

Mililani Uka started the 'Āina In Schools program and the Plastic Free Hawaii program in 2012, with an enthusiastic group of school staff and parents taking the lead to implement a strong program. The school has also hosted recycling drives and created environmental education programming with the support of Kōkua Hawaii Foundation Mini-Grants.

[163] The Kohala Center. (2012). Growing School Learning Gardens: A Summary of the 2012 Statewide School Garden Survey. Retrieved from: http://kohalacenter.org/schoolgardenhui/pdf/HFSSGH_Final_Summary_Report_2012.pdf.
[164] Data provided by the Kokua Hawaii Foundation.
[165] Kokua Hawaii Foundation. (2017). Aina in Schools. Retrieved from: https://www.kokuahawaiifoundation.org/aina.
[166] Kokua Hawaii Foundation. (2017). 3R's School Recycling Program. Retrieved from: https://www.kokuahawaiifoundation.org/3rs.
[167] Kokua Hawaii Foundation. (2017). Plastic Free Hawaii. Retrieved from: https://www.kokuahawaiifoundation.org/pfh.
[168] Kokua Hawaii Foundation. (2017). 2016-2017 Year End Report. Retrieved from: https://kokuahawaiifoundation.org.

Public Charter Schools

Many of Hawaii's Public Charter Schools have also promoted sustainability and sustainable practices either through the Nā Lei Na'auao, the Native Hawaiian Charter School Alliance, or as a part of their own entire curriculum. These include:

The School for Examining Essential Questions of Sustainability

The entire curriculum for the School for Examining Essential Questions of Sustainability (SEEQS) is modelled after sustainability through interdisciplinary investigation of questions essential to Hawaii's future. This newly authorized public charter school, established in 2013, is presently serving 6th- 8th grade students.[169]

Waimea Middle School

Hosts a one-acre Mala'ai culinary garden. According to the Mala'ai Garden Classroom 2015-2016 School Year Annual Report, 297 classes participated in the garden, 855 lbs of produce was harvested, weighed, and recorded, 1,452 volunteer hours were dedicated to the culinary school garden, and all 266 students of Waimea Middle School were provided with garden experiences.[170]

Ka`ohao School

Became the first school in Hawaii to achieve a Zero-Based Waste program schoolwide in 2016 and won a national award from the EPA's 2016 Food Recovery Challenge for the 2014-2015 school year.[171] Ka'ohao School, formerly Lanikai Elementary, established a "zero waste revolution," which leads the state and the nation in organics waste reduction with a philosophy and practice of "Zero Waste." Teaching that all discarded materials are regarded not as trash but as valuable resources consistent with a near-perfect record of waste collection and on-site processing of food waste, paper, cardboard, and green waste. As of December 2016, 100% of all the school's food waste was recovered and composted on site to total 1,673 pounds. Total food waste recovered and composted by 2017 was 9,308 pounds, or 4.65 tons. 100% of all HI-5 cans and bottles were collected, sorted, and redeemed. The campus processed 99% of all green waste, and 98% of paper and cardboard waste.[172]

Kona Pacific Public Charter School

Hosts multiple farm to school programs, which include a school garden, FoodCorps, FarmCorps Hawaii, WHOLE Community Foodservice, West Hawaii Summer Lunch, USDA Farm to School, West Hawaii Community Kitchen, NRCS "Food Forest Park", and the Hawaii Island Charter School Foodservice Hui. In 2015, Kona Pacific Public Charter School received a $1.2 million grant-in-aid from the Hawaii State Legislature for a new kitchen facility, which will house two complete kitchens: one for the community's foodservice, and another to serve as a value-added processing facility for local farmers to assist west Hawaii's regional agricultural economy.[173]

[169] The School for Examining Essential Questions of Sustainability. (2017). Retrieved from: http://www.seeqs.org/.
[170] Malaai. (2016). Malaai Annual Report. Retrieved from:http://malaai.org/wp-content/uploads/Malaai-Annual-Report-2015-2016.pdf.
[171] U.S. Environmental Protection Agency. (2016). Sustainable Management of Food: About the 2016 Food Recovery Challenge Award Winners. Retrieved from: https://www.epa.gov/sustainable-management-food/about-2016-food-recovery-challenge-award-winners.
[172] Kaohao School. (2017). Zero Waste Revolution Website. Retrieved from: http://kaohaoschool.org/zero-waste-revolution/.
[173] Legislature grants $1.2M for school kitchen facility. (2015, May 8), West Hawaii Today. Retrieved from: http://westhawaiitoday.com/news/local-news/legislature-grants-12m-school-kitchen-facility.

1.2 Percentage of Residents Understanding and Supporting Sustainability Practices:

Due to the lack of a permanent government sustainability coordinating entity, the percentage of residents understanding and supporting sustainability practices were unmeasured over the past decade.

1.3 Per Capita Water Consumption

This report found that per capita water consumption rates are not consistent statewide. County water utilities are the best source of information of fresh water consumption; however, county water utilities do not monitor private municipal water systems or domestic private individually owned wells.

For the purpose of measuring fresh water consumption, the county water utilities have provided the following information as reflected in Tables 10, 11, 12, and 13.

County Fresh Water Consumption Metrics

The County of Hawaii's Department of Water Supply provided the following consumption rates (Table 10) measuring their total accounts island-wide, including all residential, commercial, industrial accounts connected to the utility. The annual consumption rates are measured in 1,000 of gallons at the end of each fiscal year. For example, Fiscal Year 2017 (July 1, 2016 - June 30, 2017) measured 9,700,618,000 total gallons of water consumed island-wide for all 43,352 accounts connected to the utility.

Table 10. Hawaii County Water Consumption Rates (Fiscal Years 2008 – 2017)

Hawaii County	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017
Total Consumption (1,000 of gallons) Year to Date	9,529,866	9,171,424	9,505,218	8,806,677	9,073,329	9,230,569	9,080,401	9,195,926	9,655,031	9,700,618
Total Accounts	41,089	41,209	41,409	41,528	41,786	42,022	42,378	42,759	43,117	43,352

Source: County of Hawaii Department of Water Supply.

The County of Kauai's Department of Water provided the following consumption rates reflected in Table 11 measuring their total accounts island-wide, including all residential, commercial, industrial accounts connected to the utility. Per Capita Consumption data was not available due to the lack of population data.

Table 11. County of Kauai Water Consumption Rates (2008 – 2017)

Kauai County	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total Water Consumption	4,662,595	4,406,802	4,401,810	4,262,782	4,084,598	4,504,859	3,997,096	4,020,012	4,048,246	4,025,295

Source: County of Kauai Department of Water.

Maui County's Department of Water Supply includes the water consumption of the islands of Maui and Molokai. The data in Table 12 was provided by the Maui County Department of Water Supply does not include water consumption for private municipal water systems (e.g. Kapalu, Lanai, etc.) or for domestic private individually owned wells. As of Fiscal Year 2016, Maui County ratepayers consumed 218 gallons per capita per day.

Table 12. Maui County Water Consumption Rates per Capita per Day (Fiscal Years 2007 – 2016)

Maui County (Maui & Molokai)	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Consumption (Millions of gallons per day -MGD)	36.846	35.061	33.079	33.462	33.892	34.725	36.309	32.471	32.012	32.289
Population (90% of Total)	113,544	133,305	136,282	138,054	139,432	141,202	142,739	144,932	147,138	148,253
Per Capita (Gallons per day-GPD)	307	263	243	242	243	246	254	224	218	218

Source: Maui County Department of Water Supply.

The City and County of Honolulu's Board of Water Supply's 2016 Water Master Plan cites the date of total gallons per capita daily used on Oahu, as reflected in Table 13. The Board of Water Supply's-served population excludes the military, private water systems, and absent residents, but includes visitors. The Water Master Plan incorporates the water strategies of the Hawaii Fresh Water Initiative's *Blueprint for Action* into its resource planning. The BWS has a long and successful track record of promoting water conservation, as evidenced by the reduction in per capita water use in the last 30 years.

Table 13. City and County of Honolulu Board of Water Supply Water Consumption Rates per Capita per Day (2000 – 2020)

City & County of Honolulu	2000	2010	2015 (Projected)	2020 (Projected)
Total Gallons Per Capita Daily	180	155	154	150
Population	876,156	921,900	944,000	966,400

Source: City and County Board of Water Supply, 2016 Water Master Plan.

Water Auditing

The State Department of Health describes that there are over 50 county-run public water systems statewide as well as an additional 50 large capacity public water systems and public water systems operating in designated ground water management areas.[174] It is believed that many of these water distribution systems may be operating with inefficiencies, resulting in a loss of water, increasing energy costs, and potential loss of revenue. To improve the efficiency of water delivery and identify losses in the system, Act 169 was enacted in 2016 requiring the State's Commission on Water Resource Management to assist each county utility to develop a statewide standardized water audit of their county's public water systems.

This statewide water auditing system will be managed by the State's Commission on Water Resources Management; the Commission will provide the counties with technical assistance until July 1, 2021. Beginning on July 1, 2018, each county public water system will submit a completed and validated water loss audit report over the previous year to the Commission on Water Resources Management. By July 1, 2020, all other remaining large capacity public water systems and public water systems in water management will begin to submit a completed and validated water loss audit report over the previous year to the Commission on Water Resources Management.[175]

Water Smart Software

Two county public water systems recently piloted a program with the WaterSmart Program. WaterSmart targets improved water-use efficiency and greater financial control. Households participating in the pilot program can now see their accounts digitally, receive leak alerts, learn how their water use compares to similar households via their WaterScore, and gain actionable information about how and when to reduce their use in order to lower their water bills.[176] The City and County of Honolulu's Board of Water Supply established a one year pilot program with WaterSmart in March 2017 for 38,000 participating households on Oahu.[177] Hawaii County also established a pilot-program with the WaterSmart Program in September 2016 with 10,000 accounts participating. Due to water restrictions and well problems in the Kona area, Hawaii County's pilot program was paused in April 2017.

Hawaii Fresh Water Initiative

The Hawaii Fresh Water Initiative was launched in 2013 to bring multiple, diverse parties together to develop a forward-thinking and consensus-based strategy to increase water security for the Hawaiian Islands. This Hawaii Fresh Water Initiative was organized by the Hawaii Community Foundation. The Initiative relied on the "Hawaii Fresh Water Council," a panel of individuals with deep knowledge of water and a vision for a more secure and sustainable water future for Hawaii. Their *Blueprint for Action: Water Security for an Uncertain Future (2016-2018)* provides Hawaii policy and decision-makers with a set of solutions that should be adopted between 2016 and 2018 to put Hawaii on a path toward water security.[178]

[174] Act 169, Session Laws of Hawaii. (2016). Water Audit. Retrieved from: https://www.capitol.hawaii.gov/session2016/bills/SB2645_CD1_.pdf.
[175] State of Hawaii, Commission on Water Resources Management. (2017). Hawaii Water Audit Validation Effort (WAVE). Retrieved from: http://www.hawaiiwaterloss.org/.
[176] WaterSmart Software. (2017). About Us. Retrieved from: https://www.watersmart.com/.
[177] City and County of Honolulu, Board of Water Supply. (Feb 2017). Board of Water Supply to Test Online WaterSmart Program. Retrieved from: http://www.boardofwatersupply.com/news-events/news-releases/2017/news-release-bws-to-test-online-watersmart-program.
[178] Hawaii Community Foundation, Hawaii Freshwater Initiative. (2016). A Blueprint for Action: Water Security for an Uncertain Future (2016-2018). Retrieved from: https://www.hawaiicommunityfoundation.org/strengthening/fresh-water.

One of the strategy areas of the Blueprint's statewide goal of 100 MGD in additional fresh water capacity pertains to this Hawaii 2050 Sustainability "Per Capita Water Consumption" indicator and emphasizes that the public and private sectors must work together to achieve by 2030 [179]:

- **Conservation**: Improve the efficiency in how water is transported and used so that each Hawaii resident requires 15% less water per capita to meet our needs.

Statewide Fresh Water Use (2013)

Finally, the U.S. Geological Survey (USGS) provided the following data in a presentation to the Hawaii Water Works Association in 2013, which reflects the use of freshwater throughout the State of Hawaii between 1985 and 2010. The data are limited due to incomplete reporting of pumpage and surface water diversions, unknown water usage, and changes in methods used to estimate missing data.

At the time of this presentation, the incomplete groundwater pumpage reporting consisted of data reported for 30% of registered wells, and data not reported for 70% of registered wells throughout the state. The USGS data reflected in Figure 16 show that the primary uses of Hawaii's fresh water are for public supply and irrigation. The USGS found that between 1985 and 2010, Hawaii's public water supply use increased as the population increased, as depicted in Figure 17.[180]

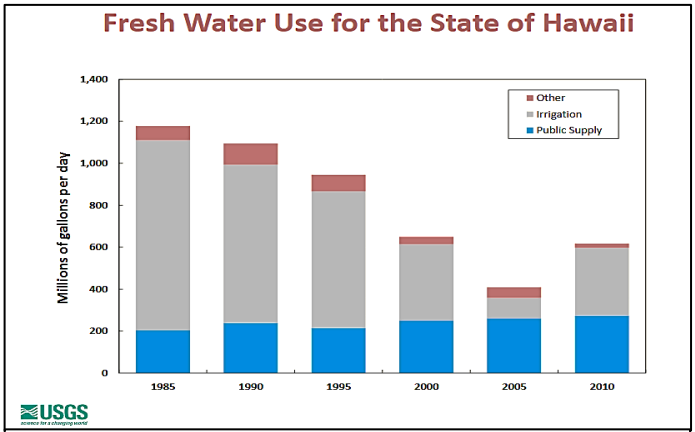

Figure 16. Fresh Water Use for the State of Hawaii. Presentation to the Hawaii Water Works Association (2013).
Source: U.S. Geological Survey

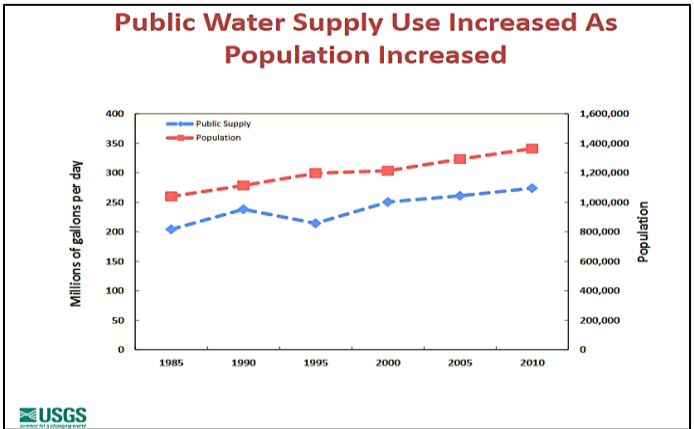

Figure 17. Statewide Public Water Supply Use Increased as Population Increased. Presentation to the Hawaii Water Works Association (2013).
Source: U.S. Geological Survey

[179] Hawaii Community Foundation, Hawaii Freshwater Initiative. (2016). A Blueprint for Action: Water Security for an Uncertain Future (2016-2018). Retrieved from: https://www.hawaiicommunityfoundation.org/strengthening/fresh-water.
[180] Miller, L., U.S. Geological Survey. (2013). Presentation to the Hawaii Water Works Association Conference. "Water Use in Hawaii". Retrieved from: https://hi.water.usgs.gov/presentations/HWWA_20131023_WaterUse.pdf.

1.4 Per Capita Energy Consumption:

The *State of Hawaii's 2016 Data Book* provides the primary energy consumption (in BTU: British Thermal Units) per capita statewide data from 1994-2015, Figure 18 reflects the statewide primary energy consumption between 2007 and 2015. Over the past eight years Hawaii's statewide per capita energy consumption reduced by 57.4 British Thermal Units (BTUs).

The Hawaii State Energy Office provides a more in depth analysis of each island's residential average monthly energy use between 2011 and 2016 in the *Hawaii Energy Facts & Figures Report (May 2017)* depicted in Figure 19.

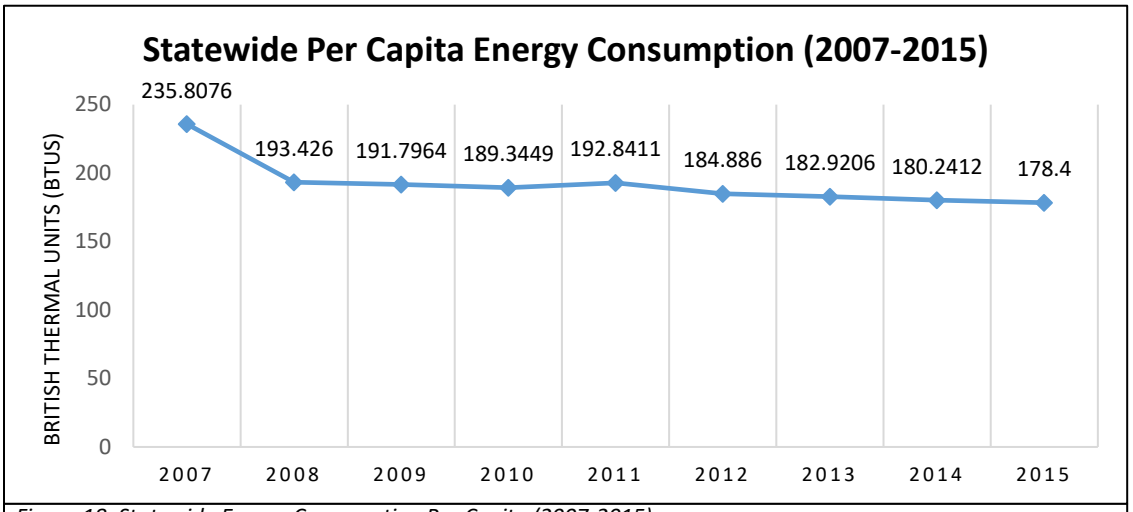

Figure 18. Statewide Energy Consumption Per Capita (2007-2015).
Source: Data compiled from the 2016 State of Hawaii Data Book.

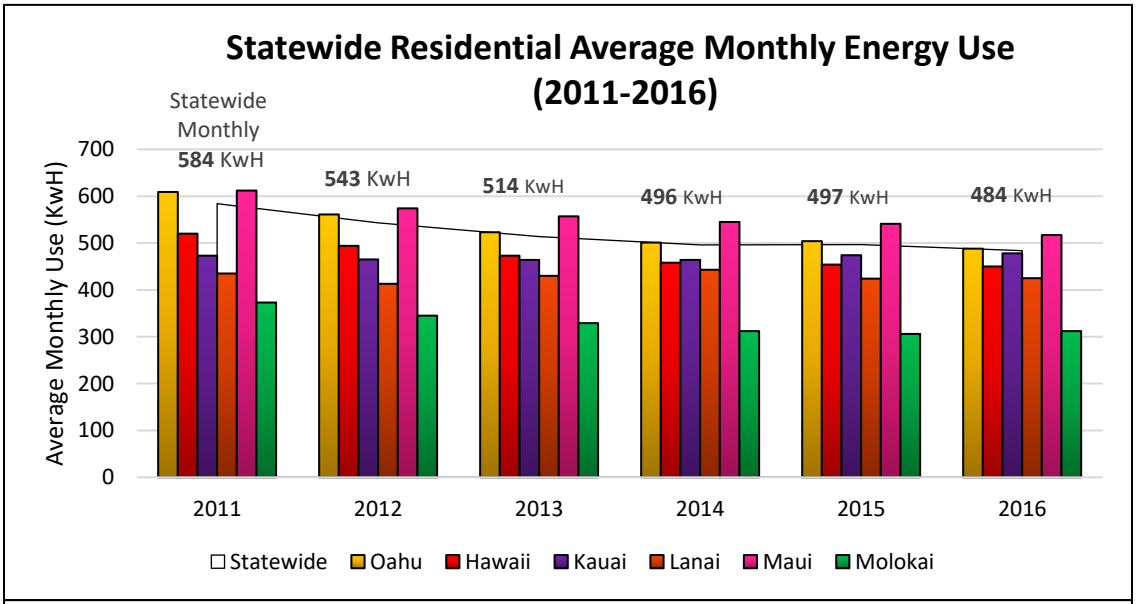

Figure 19. Statewide Residential Average Monthly Energy Use (2011-2016).
Source: Data compiled from the Hawaii Energy Facts & Figures Report (May 2017).

1.5 Percentage of Renewable and Alternative Energy:

Since its establishment in 2008, the Hawaii Clean Energy Initiative (HCEI) helped direct Hawaii toward a clean energy future. Over the past decade, Hawaii's renewable portfolio standard experienced a growth rate of 18% and surpassed its recent mandated RPS goal of 15% RPS by 2015 as depicted in Figure 20.

According to the Hawaii State Energy Office's *Facts and Figures May 2017 Report*, renewable energies generated statewide in 2016 were diversified as depicted in Figure 21.

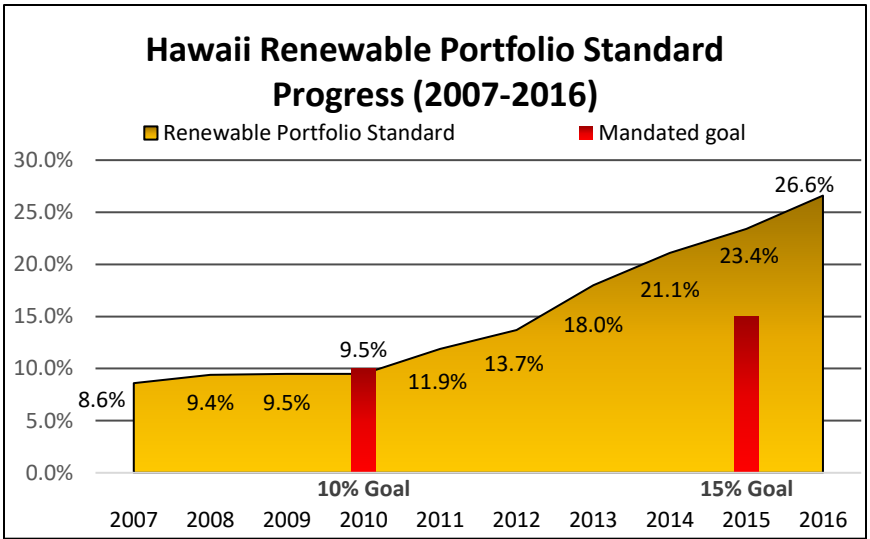

Figure 20. Hawaii Renewable Portfolio Standard Progress (2007-2016).
Sources: Data compiled from the Hawaii Renewable Portfolio Standards Act, and Hawaii State Energy Office.

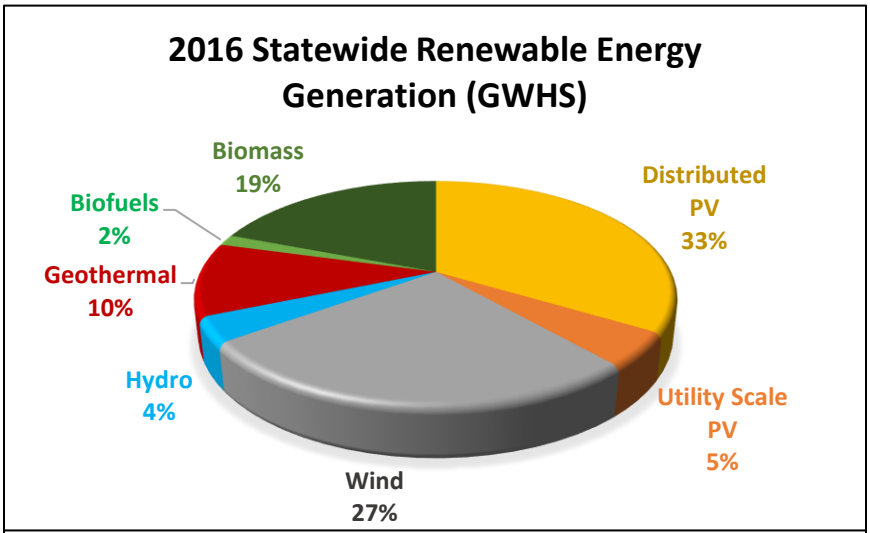

Figure 21. 2016 Statewide Renewable Energy Generation.
Source: Hawaii State Energy Office

1.6 Percentage use of Solar or Other Alternative Water Heating Sources:

After much study, this report found there are no reporting requirements for the use of solar water heating sources. Two rebates (federal and state) are offered for the installation of a solar water heater in residential and commercial areas. The State's rebate for the installation of solar water heaters is pursuant to §235-12.5 (b) (1) of the Hawaii Revised Statutes. Effective January 1, 2010, §196-6.5 of the Hawaii Revised Statutes also required that new single-family dwellings built on or after January 1, 2010 shall include the use of solar water heaters. Therefore, this solar water heater requirement for new single-family dwellings does not allow for the claim to the rebate program under §235-12.5 (b) (1) of the Hawaii Revised Statutes. It is important to note that there is an exemption to this requirement by allowing the use of a variance from installing a solar water heater for new single-family dwellings built on or after January 1, 2010, provided that the new single-family dwelling attests that installation is impractical due to poor solar resources, is cost-prohibitive, an alternative renewable energy technology system is substituted as the primary energy source for heating water, or a gas-tankless instantaneous water heater device is used.

Due to the gap of reporting requirements between the use of the rebates claimed by commercial buildings or homes built before January 1, 2010 and use of variances from solar water heating requirements on new single-family dwellings built on or after January 1, 2010, this indicator is now difficult to measure.

1.7 Number of Government, Business, Labor and Community Organizations that Adopt Sustainability Practices and Policies:

Due to the lack of a permanent government sustainability coordinating entity, the number of government, business, labor, and community organizations that adopt sustainability practices and policies was not measured over the past decade.

1.8 Percentage of New Cars Purchased That Use Renewable Fuel Technology:

The Department of Business and Economic Development and Tourism (DBEDT) reports monthly and historical data on type of vehicle registration and fuel consumption as a part of its monthly reporting of energy trends. New car purchases are not separated from the total of taxable vehicle registrations measured by this data.

Figure 22 provides a visualization of the recent growth of vehicles using renewable fuel technologies over the last ten years, based on the information of the registered electric and hybrid vehicles in the State of Hawaii.

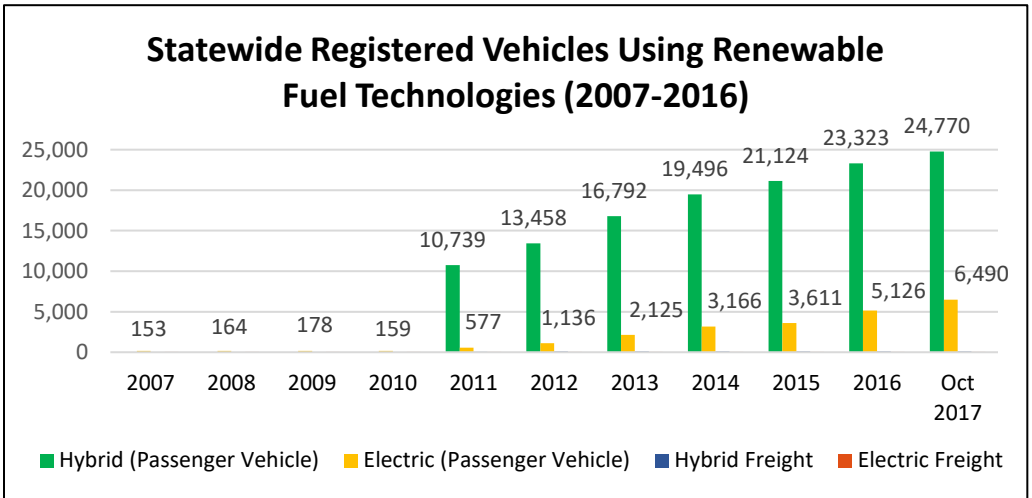

Figure 22. Statewide Registered Vehicles Using Renewable Fuel Technologies (2007-2017).
Source: Department of Business Economic Development and Tourism

As of December 2017, DBEDT reported the following data of total registered electric and hybrid vehicles using renewable fuel technologies used statewide, compiled in Table 14.

Table 14. Statewide Percentage of Registered Vehicle Populations (2017)

	Registered Electric Vehicles		Registered Vehicles Using Hybrid Fuel Technologies		Registered Vehicles Using Fossil Fuel			
Type of Vehicle	Registered Passenger Electric Vehicles	Registered Electric Freight Vehicles	Registered Passenger Hybrid Vehicles	Registered Hybrid Freight Vehicles	Registered Gasoline Passenger Vehicles	Registered Gasoline Freight Vehicles	Registered Diesel Passenger Vehicles	Registered Diesel Freight Vehicles
December 2017	6,687	10	24,918	92	1,019,106	47,071	8,809	24,152
Combined Total	6,697		25,010		1,066,177		32,961	
Percentage of Registered Vehicle Population	0.6%		2.2%		94.3%		2.9%	

NOTE: Data does not include "Miscellaneous Fuel" measurements (Misc. Fuel for Passenger: 1,289, Misc. Fuel for Freight: 100)
***Data does not measure "percentage of new car purchased", data measures total taxable registered vehicles within the State of Hawaii.*
Source: Compiled from data provided by DBEDT "Monthly Energy Data: Historical Data."

1.9 Percentage of Households Participating in Recycling:

This report found that this indicator was unmeasurable due to the varied recycling programs offered by the four counties. It is important to note that China's 2017 prohibition of importing certain paper and plastic recyclables may adversely affect Hawaii's county recycling programs. The City & County of Honolulu completed its island-wide implementation of a residential curbside recycling program in May 2010, which includes 160,000 homes yielding approximately 23,000 tons of mixed recyclables collected each year. The City & County of Honolulu also accepts other recyclable material at its six Refuse and Recycling Centers and three Transfer Stations throughout Oahu.[181] Similarly, Maui County reinstated its curbside recycling pilot project in 2015 for the South Maui residential area.[182]

Kauai County does not offer a curbside recycling program due to the lack of processing capacity. Kauai County is underway in developing a clean Materials Recovery Facility that will enable sorting and processing of recyclables as well as a proposed future residential curbside collection program of green waste and recyclables in FY 2019 to increase the island's recycling rate.[183] Finally the County of Hawaii similarly does not offer a municipal curbside recycling program; instead, residents self-haul their rubbish and recyclables to any of the county's 22 recycling and transfer stations.[184]

All counties have enacted forms of ordinances to reduce the use of single-use non-compostable plastic bags, requiring households to adapt to reusable grocery bags.

- **Maui County adopted Plastic Bag Reduction Ordinance 2587 in 2008, it became effective in 2011**. The law prohibited businesses from providing plastic bags to their customers at the point of sale.[185]

- **Kauai County adopted Plastic Bag Reduction Ordinance 885 in 2009, it became effective in 2011**. The law required retail establishments to provide only recyclable paper bags, biodegradable bags and/or reusable bags.[186]

- **Hawaii County adopted Plastic Bag Reduction 12-1 in 2012, which became effective in 2013**. The law banned businesses from providing individual, single-use plastic bags to customers for free or for purchase at the point of sale.[187]

- **Honolulu County adopted its Plastic Bag Ban Ordinance 17-37 in 2017, it will be effective in 2020**. The law requires retailers providing reusable bags, compostable plastic bags, or recyclable paper bags to charge customers a minimum of 15 cents per bag. The fee becomes effective in July 2018. Compostable bags and thicker plastic bags will be banned in 2020.[188]

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[181] City and County of Honolulu, Department of Environmental Services. (2017) 3-Cart Refuse/ Recycling Collection. Retrieved from: http://www.opala.org/solid_waste/curbside.htm.
[182] County of Maui, Environmental Management. (2017). Curbside Collection - The 3 Can Plan. Retrieved from: https://www.mauicounty.gov/1869/Curbside-Collection---The-3-Can-Plan.
[183] County of Kauai-Department of Public Works. (May 2016). FEA-FONSI for the Environmental Assessment of Materials Recycling Facility for County of Kauai to the State Office of Environmental Quality and Control. Retrieved from: http://oeqc.doh.hawaii.gov/Shared%20Documents/EA_and_EIS_Online_Library/Kauai/2010s/2016-06-08-KA-5B-FEA-Materials-Recycling-Facility.pdf.
[184] County of Hawaii, Department of Environmental Management. (2017). Solid Waste and Recycling Division. Retrieved from: http://www.hawaiizerowaste.org/.
[185] County of Maui, Environmental Management, Environmental Protection & Sustainability Services. (2010). Plastic Bag Reduction – B.Y.O. Bag. Retrieved from: https://www.mauicounty.gov/1688/Plastic-Bag-Reduction---BYOBag.
[186] County of Kauai, Public Works, Solid Water Recycling Program. (2015). Plastic Bag Reduction Ordinance. Retrieved from: http://www.kauai.gov/BagOrdinance.
[187] County of Hawaii, Department of Environmental Management, Solid Waste Division- Recycling Section. (2014). Plastic Bag Reduction Ordinance Frequently Asked Questions (FAQ). Retrieved from: http://www.hawaiizerowaste.org/site-content/uploads/Plastic_Bag_Reduction_Ordinance_-_Frequently_Asked-Questions_2014-02-06.pdf.
[188] City and County of Honolulu, City Council. (2017). Bill 59 (2016), FD1, CD3. Retrieved from: http://www4.honolulu.gov/docushare/dsweb/Get/Document-195377/BILL059(16)%2c%20FD1%2c%20CD3.pdf.

Goal 2: Sustainable Economy

The Hawaii 2050 Sustainability Plan emphasized that "a sustainable Hawaii cannot occur without a sustainable economy" and that "diversification makes our economy more resilient in the face of an unpredictable future." (Hawaii 2050 Sustainability Plan, p.25) The Hawaii 2050 Sustainability Plan recommended the investment in diversified agriculture, fisheries and aquaculture, and knowledge- and innovation-based industries such as high tech, healthcare, biotechnology, film, and digital media as important components to building a sustainable economy. The Hawaii 2050 Sustainability Plan likewise emphasized the need for a strong workforce to develop a strong economy. This recommendation included strengthening public education, increasing the availability and quality of jobs, as well as strengthening the training of Hawaii's skilled workforce. Finally the Hawaii 2050 Sustainability Plan focused on the importance of financing, repairing, and maintaining Hawaii's critical infrastructure to prepare for future population growth and demand.

To measure this goal of establishing a sustainable economy, the Hawaii 2050 Sustainability Plan provided four strategic actions based off of the following 11 indicators:

STRATEGIC ACTIONS:

1. **Develop a more diverse and resilient economy.**
2. **Support the building blocks for economic stability and sustainability.**
3. **Increase the competitiveness of Hawaii's workforce.**
4. **Identify, prioritize, and fund infrastructure "crisis points" that need fixing.**

11 INDICATORS:

1. **Percentage of local economy by industries and sectors.**
2. **Percentage of science-and technology-based workers.**
3. **Number of post-secondary science and engineering students.**
4. **Gross licensing revenue from commercialized university research.**
5. **The level of university, government, and private sector research and development.**
6. **The number of living wage jobs as a percentage of total jobs in Hawaii, compared to the national average.**
7. **Dollars spent in locally owned businesses.**
8. **Value of goods and services imported and exported.**
9. **Income of top quintile relative to the bottom quintile.**
10. **Proportion of food produced and consumed locally.**
11. **Dollar value and number of acres in agricultural production.**

Summary of Progress toward the "Sustainable Economy" Strategic Actions and Indicators:

The Hawaii 2050 Sustainability Plan's second goal to integrate sustainability throughout our economy, has generally progressed over the past decade. Although still heavily reliant upon Hawaii's hospitality and tourism economic cluster, economic clustering data show the progression and development of a diverse economy. The Hawaii Clean Energy Initiative again led Hawaii's progress toward a more diverse and resilient economy over the past decade by developing more clean energy projects and initiatives. Additional government support through similar progressive, sustainable, and highly coordinated initiative policies could help Hawaii diversify its economy while investing in more sustainable projects.

- **Outdated Indicators**

Data associated with some of this goal's indicators were not tracked or were outdated. Should the State fund a formal update to the Hawaii 2050 Sustainability Plan, this report recommends the update of economic indicators to measure a more diverse and resilient economy. A future Hawaii 2050 Sustainability Plan should also study economic shocks and stresses and provide indicators to improve Hawaii's economic resilience.

- **Affordability Problem**

Data based off this goal's indicators show that affording to live in Hawaii has grown to be more challenging over the past ten years.

- **Agricultural Land Use Decreased**

A 2015 agricultural land use baseline assessed the agricultural land use changes over various periods of time the most recent comparison was between 1980 and 2015 agricultural land use statewide. The report found that there was a significant decrease in Hawaii's agricultural land use between 1980 and 2015. Over the past 35 years, Hawaii's experienced a 56% reduction of active crop use on agricultural lands and a 30% decrease of pasture lands statewide. Improved policy coordination is needed to understand how much agricultural acreage and water is necessary to produce a sustainable yield a local food for the state's population.

- **Agricultural Production and Consumption is Not Measured**

Local agricultural consumption data is not monitored or available. Policies must be established to improve coordination and thorough measurement of local agricultural production and local agricultural consumption. "Food" must be delineated from agricultural production since local farmers produce agricultural goods including coffee and macadamia nuts, but these commodities may not necessarily imply "local food" for Hawaii's goals for sustainable food sources.

Measurement of Indicators:

2.1 Percentage of Local Economy by Industries And Sectors:

According to Department of Business Economic Development and Tourism (DBEDT), Hawaii's economy is not easily summarized into conventional industry sectors common to economic analysis, (i.e. those categories that comprise the Gross State Product). The primary source of income for Hawaii is the visitor sector, which spreads itself over several industries, such as service, transportation and retail trade.[189]

2.2 Percentage of Science and Technology-Based Workers:

The State's Department of Labor and Industrial Relations (DLIR) compiles information on Hawaii's labor force and employment through their research and statistics division. The data in Figure 23 reflects the statewide annual job count within the "science and technological services" industry.

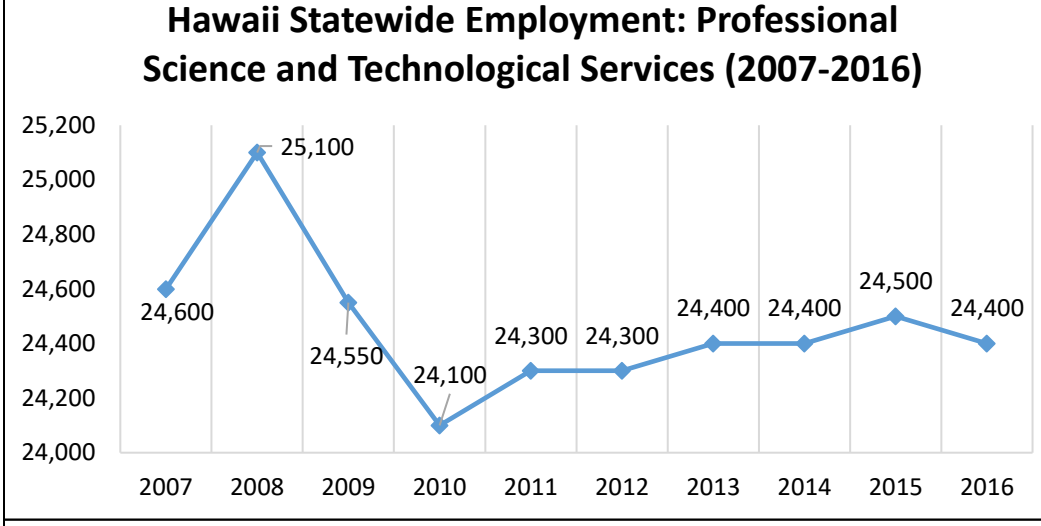


Figure 23. Hawaii Statewide Employment: Professional Science and Technological Services (2007-2016).
NOTE: Not seasonally adjusted data.
Source: DLIR Research and Statistics, Job Count by Industry 2007-2016 reports.

[189] State of Hawaii, Department of Business Economic Development and Tourism, Information Services. (2008). Frequently Asked Questions Webpage. Retrieved from: http://dbedt.hawaii.gov/economic/library/faq/faq08/.

The State's Department of Education (DOE) has also engaged in several strategies to strengthen career pathways for public school students:

Career and Technical Education Pathways

As of the 2017-2018 school year, 75% of high schools (43 of a total of 57) have career and technical education (CTE) pathways. The DOE's CTE vision is to "make sure that all CTE students fully develop their career and academic potential." This vision includes four core principles[190]:

- **Alignment.** Effective alignment between CTE and labor market needs to equip students with 21st-century skills and prepare them for in-demand occupations in high-growth industry sectors.
- **Collaboration.** Strong collaboration among secondary and post-secondary institutions, employers, and industry partners to improve the quality of CTE programs.
- **Accountability.** Meaningful accountability for improving academic outcomes and building technical and employability skills in CTE programs, based upon common definitions and clear metrics for performance.
- **Innovation.** Increased emphasis on innovation supported by systemic reform of state policies and practices to support CTE implementation of effective practices at the local level.

The CTE curricular and assessments program is structured around programs of study, core standards, and performance-based assessments. It also includes the Hawaii Career Pathway System Handbook, which details the six career pathways and the occupations that are in each.[191] The career pathways and the organization of occupations within those pathways were determined through a collaboration between educators and business and industry representatives. The six career pathways are:

- Arts and Communication
- Business
- Health Services
- Industrial and Engineering Technology
- Natural Resources
- Public and Human Services

In addition, the program is assisted by the Pathway Advisory Council, whose members provide pathway and industry-specific expertise in the review and approval of standards and assessments.

To provide additional curricular materials and strong connections to industry, DOE high schools also have two national industry curriculum available for their use: the National Restaurant Association ProStart Culinary curriculum and the United Brotherhood of Carpenters Career Connections curriculum.[192, 193]

[190] State of Hawaii, Department of Education. (2017). Career and Technical Education webpage. Retrieved from: http://www.hawaiipublicschools.org/TeachingAndLearning/StudentLearning/C2C/Pages/CTE.aspx.
[191] State of Hawaii, Department of Education, Career and Technical Education. (undated). Hawaii Career Pathway System Handbook. Retrieved from: http://www.hawaiipublicschools.org/DOE%20Forms/CTE/CTEhandbook.pdf.
[192] National Restaurant Association. (2017). ProStart Culinary Curriculum. Retrieved from: http://www.goprostart.com/.
[193] United Brotherhood of Carpenters and Joiners of America. (2017). Career Connections Curriculum. Retrieved from:https://www.carpenters.org/citf-training/citf-training-programs/career-connections/.

Connect to Careers (C2C)

C2C, is an industry-led coalition designed to benefit Hawaii's economic future by collaboratively preparing students for success in high-skill, in-demand careers at both state and regional levels. The DOE's Community Engagement Office provides support and assistance to the C2C Program. The C2C effort rests on three pillars[194]:

- **Business Led.** Industry identifies entry level skill sets and employability qualities and collaborates on degrees and certifications that will prepare students for these opportunities;
- **Aligned Curriculum and Opportunities.** There is coordination between the K-12 and post-secondary educational systems for relevant and rigorous learning pathways; and
- **Tracking Effectiveness.** Data and industry feedback are used to determine which pathways are leading to successful careers and incomes that build and sustain thriving communities in Hawaii;

and four core principles[195]:

- **Alignment.** Effective alignment between CTE and labor market needs to equip students with 21st century skills and prepare them for in-demand occupations in high-growth industry sectors;
- **Collaboration.** Strong collaboration among secondary and post-secondary institutions, employers, and industry partners to improve the quality of CTE programs;
- **Accountability.** Meaningful accountability for improving academic outcomes and building technical and employability skills in CTE programs, based upon common definitions and clear metrics for performance; and
- **Innovation.** Increased emphasis on innovation supported by systemic reform of state policies and practices to support CTE implementation of effective practices at the local level.

The C2C coalition includes employers, state educational systems, funders, and workforce and economic development agencies. The DOE's partners have made education a policy priority and have taken a leading role in implementation. Primary examples include the Hawaii Business Roundtable, which cites working with K-12 and higher education to strengthen career readiness as a top priority in its policy action agenda for 2017 and the Chamber of Commerce of Hawaii, which is hosting quarterly industry sector summits by island to gather information about industry needs that reflect regional realities. Sector foci include finance and banking, cybersecurity, carpentry, food manufacturing, health occupations, computer science, and construction and engineering.

[194] State of Hawaii, Department of Education. (2017). Connect to Careers – C2C. Retrieved from: http://www.hawaiipublicschools.org/TeachingAndLearning/StudentLearning/C2C/Pages/home.aspx.
[195] Ibid.

2.3 Number of Post-Secondary Science and Engineering Students:

The University of Hawaii's Institutional Research and Analysis Office maintains the data of students studying post-secondary science and engineering within the University of Hawaii system. To assess the growth of education pursuing science and engineering, this report will provide the University of Hawaii's Institutional Research and Analysis Office compilation of science, technology, engineering, and mathematics (STEM) degrees and certificates awarded system-wide between 2007 and 2017 as reflected in Table 15.

Table 15. Historical Table of STEM Degrees and Certificates, Earned by College, Statewide (2007 – 2017)

	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
University of Hawaii at Manoa	734	735	720	761	867	873	1,016	1,062	976
University of Hawaii at Hilo	133	107	143	134	153	122	153	158	183
Hawaii Community College	22	21	18	14	23	19	15	36	40
Honolulu Community College	41	50	40	52	72	60	63	162	132
Kapiolani Community College	28	28	34	57	89	77	110	127	155
Kauai Community College	5	4	8	5	4	7	5	9	22
Leeward Community College	6	4	5	10	18	29	66	133	128
University of Hawaii Maui College	3	8	21	18	29	23	15	33	35
Windward Community College	N/A	N/A	N/A	N/A	9	11	39	23	29
TOTAL	**972**	**957**	**989**	**1,051**	**1,264**	**1,221**	**1,482**	**1,743**	**1,700**

NOTE: Effective Fall 2014, STEM counts were revised due to the addition of selected codes from the 04, 09, 10, 13, 28, and 29 CIP categories. These codes are found on the Department of Homeland Security's list of STEM programs and have been added to UH's STEM list. STEM counts from terms prior to Fall 2014 also reflect this updated definition. In Fall 2013, the CIP code for Honolulu Community College's APTR (Applied Trades) major was changed from 15.0699 (STEM) to 46.0000 (non-STEM). In order to be consistent with the current coding for this major, this code will need to be excluded when obtaining Honolulu CC STEM counts for terms prior to Fall 2013.
***In Spring 2015, UH's STEM definition was revised to align solely with the DHS STEM definition.*
****No University of Hawaii-West Oahu data was provided in this dataset.*
Source: University of Hawaii System, Institutional Research and Analysis Office, Degrees Table 7. Historical Table of STEM Degrees and Certificates, Earned by College Fiscal Years (July 1 to June 30) 2008-09 to 2016-17.

2.4 Gross Licensing Revenue from Commercialized University Research:

This information was not available.

2.5 The Level of University, Government, and Private Sector Research and Development:

This information was not available.

2.6 The Number of Living Wage Jobs as a Percentage of Total Jobs In Hawaii, Compared to the National Average:

Unfortunately this report found that there is no data available on the number of living wage jobs as a percentage of total jobs in Hawaii, compared to the national average. Act 12 (Special Session Laws of 2008), codified as §201-3(5) of the Hawaii Revised Statutes was enacted to require the Department of Business Economic Development and Tourism (DBEDT), beginning in 2008, to establish and update biennially a self-sufficiency standard incorporating existing methods of calculation, and reflecting costs relating to housing, food, child care, transportation, health care, clothing and household expenses, taxes, children's ages, geography, and the number of household wage earners.[196] Table 16 summarizes DBEDT's six biennial self-sufficiency reports which describe Hawaii's self-sufficiency income standards.

Table 16. Hawaii Self-Sufficiency Income Standards (2007 – 2016)

	One Adult	Two Adult Family	One Adult + One Pre-Schooler	One Adult + One Pre-Schooler + One School-Age Child	Two Adults + One Pre-Schooler + One School Age Child
2007	$26,151	$35,092	$41,761	$49,852	$55,581
2009	$28,257	$36,936	$45,373	$55,135	$61,394
2011	$33,009	$41,528	$51,106	$61,893	$68,466
2013	$31,901	$41,183	$55,031	$67,006	$73,799
2014	$31,409	$40,756	$53,766	$65,748	$72,737
2016	$32,957	$42,371	$56,157	$69,318	$75,947

Source: DBEDT Self-Sufficiency Income Standard Estimates Reports 2009, 2011, 2012, 2014, 2015, 2017.

Economic self-sufficiency is defined as the amount of money that a household requires to meet its basic needs without public assistance. Statewide, the percentages of families below the self-sufficiency standard in 2016 were[197]:

- 44.1% of single-adult families with no children
- 21.5% of two-adult families with no children
- 50.8% of single-adult families with one pre-school child
- 31.7% of two-adult with two children

According to Hawaii Appleseed's 2016 publication, *The State of Poverty in Hawaii: How Hawaii's Low Income Residents are Faring Post-Recovery*, these metrics lead to the same conclusion, that "far too many working families cannot afford to get by in Hawaii" (p.6).[198]

[196] Hawaii Revised Statutes §201-3 (5). Retrieved from: https://www.capitol.hawaii.gov/hrscurrent/Vol04_Ch0201-0257/HRS0201/HRS_0201-0003.htm.
[197] State of Hawaii, Department of Business Economic Development and Tourism. (2017). Self-Sufficiency Income Standard Estimates for Hawaii 2016. Retrieved from: http://files.hawaii.gov/dbedt/economic/reports/self-sufficiency/self-sufficiency_2016.pdf.
[198] Hawaii Appleseed Center for Law and Economic Justice. (2016). The State of Poverty in Hawaii. Retrieved from: http://hiappleseed.org/sites/default/files/State%20of%20Poverty%20%5BFINAL%5D.pdf.

A new tool called "The Living Wage Calculator" was developed in 2015 by Massachusetts Institute of Technology (MIT) professors and researchers to present a realistic estimate, tailored by region, and the cost of living across the nation.

According to MIT's "Living Wage Calculator" the living wage calculation for Hawaii shown is the hourly rate that an individual must earn to support their family, if they are the sole provider and are working full-time (2,080 hours per year). All values in Table 17 are per adult in a family unless otherwise noted. The state minimum wage is the same for all individuals, regardless of how many dependents they may have. The poverty rate is typically quoted as the gross annual income. MIT converted it to an hourly wage for the sake of comparison.

Table 17. Massachusetts Institute of Technology's Living Wage Calculation for Hawaii (2016)

Hourly Wages	1 Adult	1 Adult 1 Child	1 Adult 2 Kids	1 Adult 3 Kids	2 Adults (1 Working)	2 Adults (1 Working) 1 Child	2 Adults (1 Working) 2 Children	2 Adults (1 Working) 3 Children	2 Adults (1 Working Part Time) 1 Child*	2 Adults	2 Adults 1 Child	2 Adults 2 Kids	2 Adults 3 Kids
Living Wage	$14.97	$30.33	$38.07	$51.05	$22.72	$29.14	$31.91	$38.37	$16.84	$11.36	$16.84	$20.48	$25.99
Poverty Wage	$6.00	$8.00	$11.00	$13.00	$8.00	$11.00	$13.00	$15.00	N/A	$4.00	$5.00	$6.00	$7.00
Minimum Wage	$8.50	$8.50	$8.50	$8.50	$8.50	$8.50	$8.50	$8.50	N/A	$8.50	$8.50	$8.50	$8.50

Source: Massachusetts Institute of Technology, Living Wage Calculator. June 2016.

MIT compares state living wages to national living wages based on a family of four (two working adults, two children) before taxes.[199] According to MIT's most recent 2016 data update, the results found that state minimum wages provide for only a portion of the living wage. The results found that for two adult, two children families, and the minimum wage covers 41.5% of the living wage in Hawaii, which found Hawaii as the worst in the nation.[200] "This means that families earning between the poverty threshold ($24,491 for two working adults, two children on average in 2016) and the living wage ($65,860 on average for two working adults, two children per year before taxes), may fall short of the income and assistance they require to meet their basic needs."(Living Wage Calculator, 2016 Data Update, para 5.)

[199] Glasmier, Amy, PhD and the Massachusetts Institute of Technology. (2016). Living wage Calculator: New Data: Calculating the Living Wage for US States, Counties and Metro Areas. Retrieved from: http://livingwage.mit.edu/articles/19-new-data-calculating-the-living-wage-for-u-s-states-counties-and-metro-areas.

[200] Glasmier, Amy, PhD, and Carey Anne Nadeau, Opendata.com and the Massachusetts Institute of Technology. (13 April 2017). Results from the 2016 Data Update. Retrieved from: http://livingwage.mit.edu/articles/23-results-from-the-2016-data-update.

2.7 Dollars Spent in Locally Owned Businesses:

This report found that there was no data measuring this indicator of the Hawaii 2050 Sustainability Plan.

2.8 Value of Goods and Services Imported and Exported:

The US Census provides the value of total Hawaii imports (by state of final destination) and exports (by origin of movement series) in the value of millions of dollars, this information is reflected in Table 18.[201, 202]

Table 18. Hawaii's Total Import and Export Values (2013 – 2016)

	2013	2014	2015	2016
Import (value in millions of dollars)	6,097	5,329	3,756	2,931
Export (value in millions of dollars)	599	1,447	1,896	795

Source: U.S. Census State Imports for Hawaii, State Exports from Hawaii.

2.9 Income of Top Quintile Relative to the Bottom Quintile:

The Department of Business Economic Development and Tourism (DBEDT) arranged Hawaii's 2016 income quintile information reflected in Table 19 for the purposes of this report.

A quintile is a statistical value of a data set that represents 20% of a given population, so the first quintile represents the lowest fifth of the data (1 - 20%); the second quintile represents the second fifth (21% - 40%); the third quintile represents the third fifth (41% - 60%); the fourth quintile represents the fourth fifth (61% - 80%); and the fifth quintile represents the highest fifth (81% - 100%).

Table 19. Hawaii State Household Income in Quintiles (2016)

Quintile of Household Income	
20%	$31,000
40%	$59,140
60%	$91,000
80%	$141,000
100%	Highest value in sample ($985,200)

NOTE: The value of $985,200 is the highest value in the sample dataset, therefore, at the 100% level.
Source: U.S. Census Bureau American Community Survey 1-Year PUMS 2016, compiled by DBEDT.

The data in Table 19 show the random sample of the household population in the state, rather than the decennial census that includes all households in the population. The bottom 20% of households have a household income of $31,000 or less. The top 20% of households have a household income of $141,000 or more.

[201] U.S. Census. (2016). State Imports for Hawaii (2013-2016). Retrieved from: https://www.census.gov/foreign-trade/statistics/state/data/imports/hi.html.
[202] U.S. Census. (2016). State Exports from Hawaii. (2013-2016). Retrieved from: https://www.census.gov/foreign-trade/statistics/state/data/hi.html.

2.10 Proportion of Food Produced And Consumed Locally:

Presently, there is no data measuring local food production compared to local food consumption.

2.11 Dollar Value and Number of Acres in Agricultural Production:

The *Statewide Agricultural Land Use Baseline, 2015* provided the most recent analysis of local acreage of agricultural production throughout the State of Hawaii. The report noted that between 1980 and 2015, agricultural lands with active crop use declined from 350,830 acres to 151,830 acres in 2015. Similarly agricultural lands in pasture use declined from 1.1 million acres to 761,430 acres in 2015.[203] Figures 24 and 25 compare the severe decline of agricultural lands between 1980 and 2015. As of 2015, the combined acreage in agricultural production was 913,260 acres; this was a reduction of 56% of agricultural lands with crop use and a 30% decrease of Hawaii's pasture lands over the past 35 years.[204]

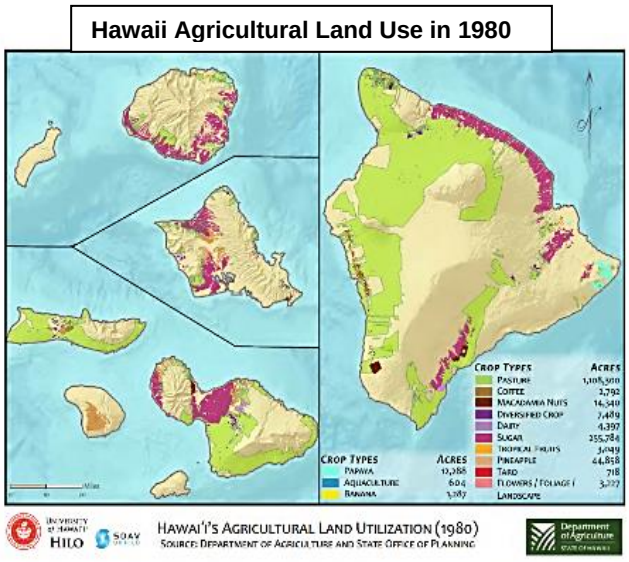


Figure 24. Hawaii's Agricultural Land Utilization in 1980. Source: Statewide Agricultural Land Use Baseline, 2015.

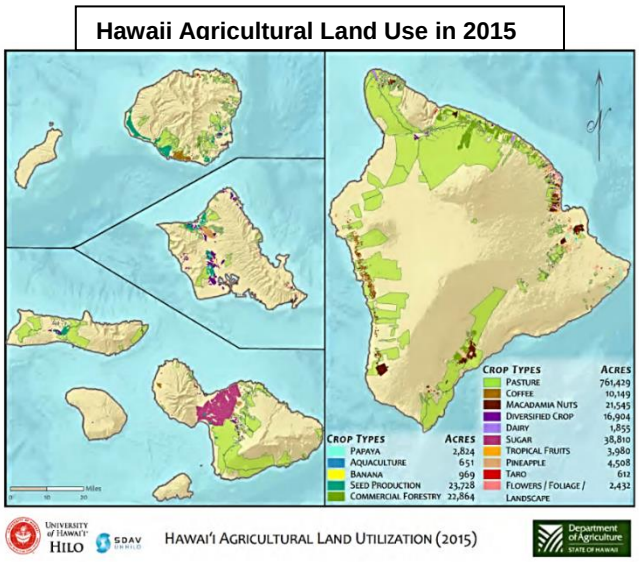


Figure 25. Hawaii's Agricultural Land Utilization in 2015. Source: Statewide Agricultural Land Use Baseline, 2015.

The 2016 Hawaii State Data Book identified the growth of cost between 2007 and 2012 on the average valuation of land and buildings per farm from $1,146,213 in 2007 to $1,461,342 in 2012, a growth rate of 27% or $315,129 in five years.[205] Average valuation of land and buildings per acre between 2007 and 2012 also increased from $7,688/acre to $9,058/acre in 2012, increasing by $1,370.00 or 17% in five years.[206]

[203] State of Hawaii, Department of Agriculture. (2015). Statewide Agricultural Land Use Baseline, 2015. Prepared by: The University of Hilo, Spatial Data Analysis & Visualization Research Lab. Retrieved from: Retrieved from: http://hdoa.hawaii.gov/wp-content/uploads/2016/02/StateAgLandUseBaseline2015.pdf.

[204] Ibid.

[205] State of Hawaii Data Book. (2016). Section 19- Agriculture. Retrieved from: http://dbedt.hawaii.gov/economic/databook/2016-individual/_19/

[206] Ibid.

Goal 3: Sustainable Environment and Natural Resources

The Hawaii 2050 Sustainability Plan highlighted the importance to preserve Hawaii's environment and natural resources, noting that in 2008 the U.S. Environmental Protection Agency found that 64% of Hawaii's streams were considered "impaired" by pollutants and the ratio of renewable energy (5%) vs. fossil fuel use (95%) ranked Hawaii as among the worst in the nation. The plan warned that "as we look toward a sustainable future, we must also prepare for the realities of rising fuel costs and climate change" (p. 35).

The U.S. Global Change Research Program published the Fourth National Climate Assessment in 2017 through the Climate Science Special Report. The report provided the scientific evidence that the Earth has experienced the warmest period in the history of modern civilization over the past 115 years, while global annual average surface air temperatures have increased by 1.8° Fahrenheit between 1901 and 2016.[207] To measure this goal of establishing a sustainable environment and natural resources, the Hawaii 2050 Sustainability Plan provided seven strategic actions and the following ten indicators.

STRATEGIC ACTIONS:

1. **Reduce reliance on fossil (carbon-based) fuels.**
2. **Conserve water and ensure adequate water supply.**
3. **Increase recycling, reuse, and waste reduction strategies.**
4. **Provide greater protection for air, and land-, fresh water-, and ocean-based habitats.**
5. **Conserve agricultural, open space, and conservation lands and resources.**
6. **Research and strengthen management initiatives to respond to rising sea levels, coastal hazards, erosion, and other natural hazards.**
7. **Develop a comprehensive environmental mapping and measurement system to evaluate the overall health and status of Hawaii's natural ecosystems.**

10 INDICATORS:

1. **Percentage of renewable and alternative energy produced locally.**
2. **Percentage of solid waste recycled and diverted from landfills.**
3. **Percentage of treated wastewater reused.**
4. **Percentage of lands and water protected for native plants and animals.**
5. **Percentage of leadership in energy and environmental design (LEED)-type building permits issued.**
6. **Percentage of new urban developments consistent with "smart growth" principles.**
7. **Percentage of shorelines threatened or retreating, and rate of loss.**
8. **Pollution level in streams, aquifers and coastal waters.**
9. **Number and types of invasive species introduced to Hawaii annually, including intra-island migration.**
10. **Water level in streams and aquifers.**

[207] Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, B. DeAngelo, S. Doherty, K. Hayhoe, R. Horton, J.P. Kossin, P.C. Taylor, A.M. Waple, and C.P. Weaver, 2017: Executive summary. In: *Climate Science Special Report: Fourth National Climate Assessment, Volume I* [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 12-34, doi: 10.7930/J0DJ5CTG.

Summary of Progress toward the "Sustainable Environment and Natural Resources" Strategic Actions and Indicators:

The Hawaii 2050 Sustainability Plan's third goal; to manage Hawaii's natural resources so that they are able to replenish themselves, has slowly progressed over the past decade.

- **Hawaii's Fresh Water Security Needs Strengthening**

As mentioned in Goal One's summary, data measuring Hawaii's water reuse: pollution levels in Hawaii's streams, aquifers, and coastal waters; and decreasing streamflows and base flow show that Hawaii's fresh water is not secured for the future. The indicators show that statewide wastewater reuse is low, pollution levels are high, and streamflows are decreasing. The *Blueprint for Action* can serve as a reference to establish a statewide framework to coordinate future water security policies, projects, funding, and initiatives throughout Hawaii.

- **Sustainable Land Use Needs to be Implemented**

No data was collected measuring smart growth development statewide. Ten years later, best practices offer other solutions to improve sustainability through land use including increasing green infrastructure development, increasing water recharge opportunities and catchment, increasing open space, improving agricultural land uses, increasing the pedestrian and bike access throughout communities, increasing multi-modal systems, reducing urban sprawl, and reducing urban heat-island effects.

Updated comprehensive planning through the counties' general and community plans and the State's functional plans to integrate sustainability plans, resiliency plans, and climate adaptation plans can serve as a foundation for a Hawaii's future in sustainable land use. Important agricultural lands (IAL) need to be identified and designated to plan for Hawaii's future in local food and agricultural production. Statewide boundary reviews will also assist land use coordination to determine which areas should be protected to replenish Hawaii's natural resources while supporting Hawaii's growing population and economic demands.

- **Not Many LEED-Certified Facilities**

Only 179 facilities were certified as sustainable LEED facilities statewide; of those, only 41 are owned by the State of Hawaii. Additional LEED-certified facilities will improve the statewide practice of sustainability, as well as reduce energy, water, waste consumption, and costs overtime.

- **Recycling is Low**

A law calling for the State of Hawaii to recycle 50% of its material by January 2000 has not yet been achieved. Fifteen years later, Hawaii hit its highest recycling measurement of 43% in 2015.

- **Hawaii's Climate is Changing**

Many policies and data identify the many indicators of a changing climate. 70% of Hawaii's coastline is eroding; Hawaii's streams are drying; the amount of rainfall is decreasing; and Hawaii's corals are bleaching. Sustainability policies and comprehensive planning can assisting Hawaii to adapt to its changing climate.

Measurement of Indicators:

3.1 Percentage of Renewable and Alternative Energy Produced Locally:

As previously indicated, since its establishment in 2008, the Hawaii Clean Energy Initiative (HCEI) was the main policy which led Hawaii toward a clean energy future based on locally produced renewable energies. Over the past decade, Hawaii's renewable portfolio standard (RPS) experienced a growth rate of 18%, and surpassed its recent mandated RPS goal of 15% RPS by 2015 as depicted in the Figure 26.

26.6% OF HAWAII'S ENERGY IS RENEWABLE

Hawaii State Energy Office

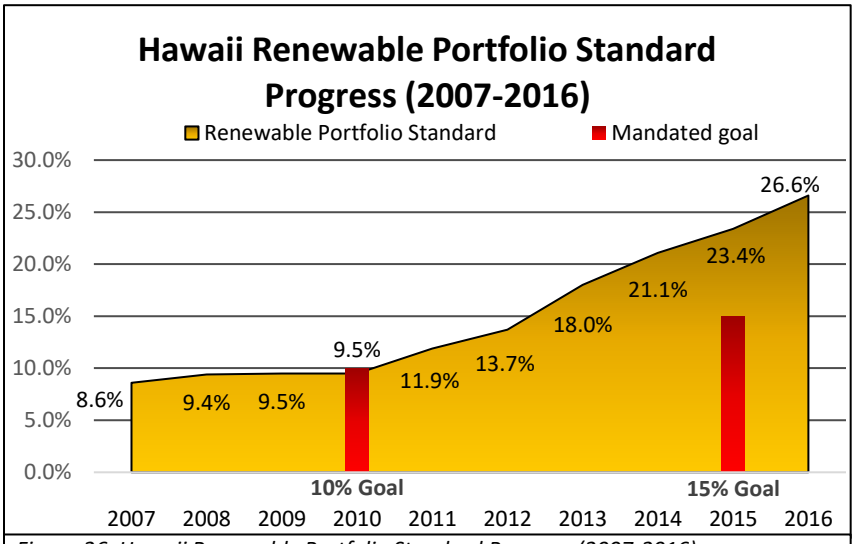


Figure 26. Hawaii Renewable Portfolio Standard Progress (2007-2016).
Sources: Hawaii Renewable Portfolio Standards Act and Hawaii State Energy Office

According to the Hawaii State Energy Office's *Facts and Figures May 2017* Report, renewable energies generated statewide in 2016 were diversified as depicted in Figure 27.

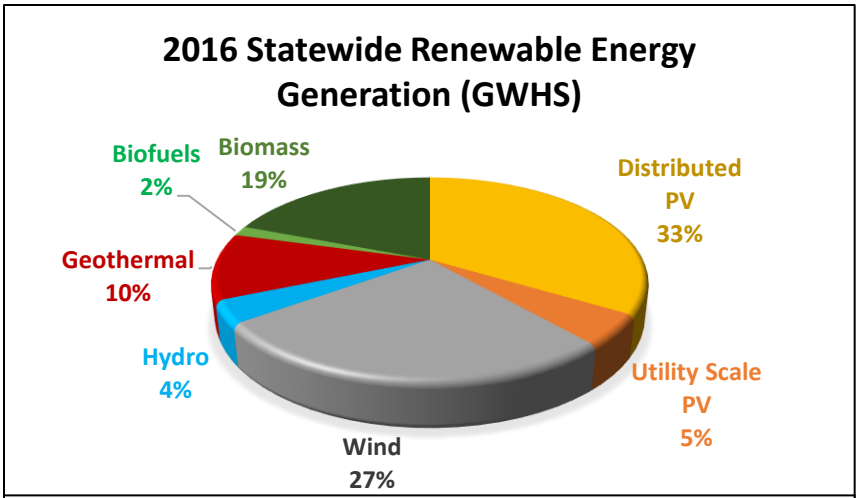


Figure 27. 2016 Statewide Renewable Energy Generation.
Source: Hawaii State Energy Office

3.2 Percentage of Solid Waste Recycled and Diverted from Landfills:

The State's Department of Health's Office of Solid Waste Management provides annual reports to the Legislature measuring the State's progress toward achieving the State's 50% recycling goal by 2000 (pursuant to §342G-3 of the Hawaii Revised Statutes).

43% OF HAWAII'S SOLID WASTE IS RECYCLED

Department of Health,
Office of Solid Waste Management

Presently, as shown through Figure 28, Hawaii's most recently measured recycling rate was 43% in 2015, and the State has not yet fulfilled its 50% recycling goal by the year 2000. The Office of Solid Waste Management annually calculates the amount of waste diversion performed by the counties and combines these measurements to determine Hawaii's diversion rate. According to Office of Solid Waste Management Annual Reports, "diversion" refers to the combination of reuse and recycling activities; it does not include landfilling, incineration, or waste to energy processes.[208] This "diversion rate" is composed primarily of recycling activity and a small amount of reuse activity of each county's tonnage of waste diverted.

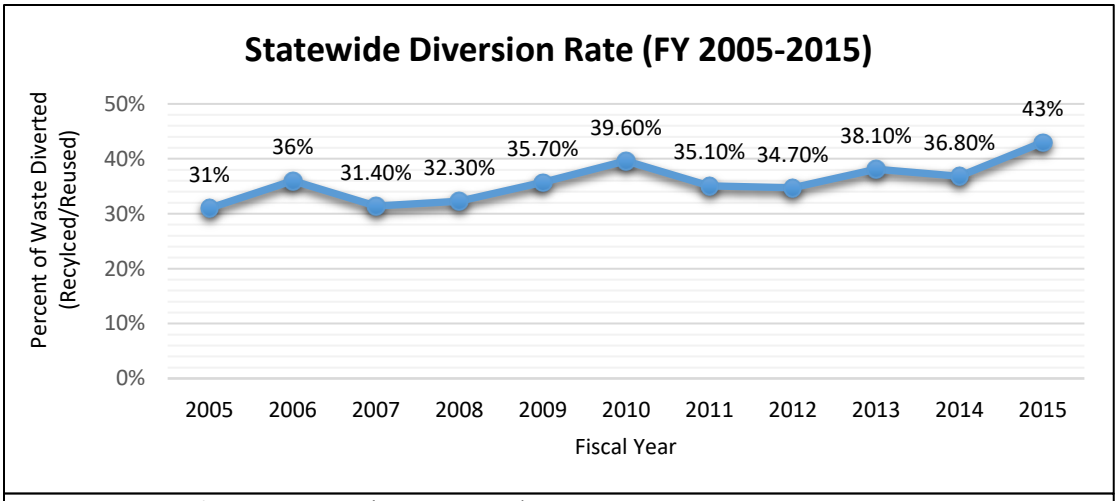


Figure 28. Statewide Diversion Rate (FY 2005 - 2015)
Compiled from data provided by Hawaii State Department of Health Office of Solid Waste Management Annual Reports between 2005 and 2016.

[208] State of Hawaii Department of Health, Office of Solid Waste Management. (2015). 2016 Annual Report to the Legislature. Retrieved from: https://health.hawaii.gov/shwb/files/2013/06/2016_OSWM_Annual_Report.pdf.

3.3 Percentage of Treated Wastewater Reused:

Wastewater is increasingly being viewed as a commodity with potential for resource recovery and reuse.[209] The State Department of Health's Wastewater Branch monitors the reuse of wastewater throughout the state. Figure 29 shows that as of 2016, 12.84% of Hawaii's wastewater is reused statewide, this is a decrease from Hawaii's highest wastewater reuse percentage of 16.4% in 2014.

12.84% OF HAWAII'S TREATED WASTEWATER IS REUSED

Department of Health, Wastewater Branch

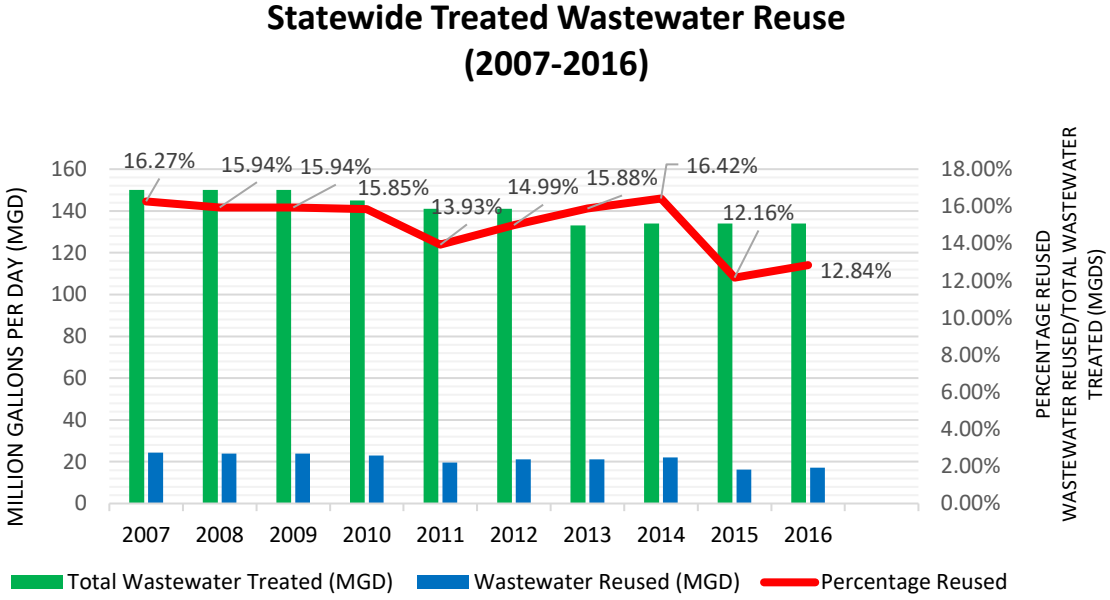


Figure 29. Statewide Wastewater Reuse (2007- 2016).
Compiled from data provided by Hawaii State Department of Health's Wastewater Branch.

Hawaii Fresh Water Initiative

The Hawaii Fresh Water Council *Blueprint for Action: Water Security for an Uncertain Future, 2016-2018* recognized the need for a more integrated "One Water" approach to sustainable water management for Hawaii's future.[210] One of the *Blueprint for Action's* three goals focuses on water reuse, thus replacing the demand for potable water to be used for irrigation and other purposes. If fulfilled, this goal would yield 30 MGD in increased water availability by 2030.

- **Reuse**: More than double the amount of wastewater currently being reused in the islands to 50 MGD while reducing by nearly half the amount of wastewater currently being discharged directly into the ocean around the Hawaiian Islands. By 2030, this goal will yield a target 30 MGD in increased water availability.

[209] American Planning Association. (2017). PAS Report: Planners and Water. https://www.planning.org/publications/report/9131532/.
[210] Hawaii Community Foundation, Hawaii Fresh Water Initiative. (2015). A Blueprint for Action: Water Security for an Uncertain Future, 2016-2018. Retrieved from: https://www.hawaiicommunityfoundation.org/learning/a-blueprint-for-action-water-security-for-an-uncertain-future-2016-2018.

The *Blueprint for Action* recommended the following implementation policies by the end of 2018 [211]:

- **Revise the Hawaii Department of Health's Water Reuse Guidelines**:
  - According to the State Department of Health, Hawaii's Water Reuse Guidelines were revised on January 2016.[212]
- **Revise Greywater Guidelines** (by promoting the expanded use of greywater for landscape irrigation and groundwater recharge via updated state and county rules for new construction, while also allowing facilities and homeowners to retrofit current plumbing systems, and prioritizing the adoption of the 2012 Uniform Plumbing Code):
  - **Act 141 (HB 637), 2017**: Required the State Building Code Council to adopt codes or standards within two years of official publication; otherwise, the codes will be automatically adopted into the Hawaii State Building Code until such adoption is effectuated.[213]
- **Increase Water Reuse for Large Landscaped Areas**

Water reclamation laws were also recently enacted, including:

- **Act 229 (HB 1394), 2015:** Established a water scalping pilot project water scalping feasibility study at DOT Airports.[214]
- **Act 170 (HB 1749), 2016:** Amended the goals of the Hawaii water plan to include the utilization of reclaimed water for uses other than drinking and for potable water needs in all state and county facilities by 2045.[215]

Water Reclamation in the Department of Transportation

The State Department of Transportation recently completed its *Feasibility Study on the Use of Water Scalping Technology at Honolulu International Airport, Kahului Airport, Kona International Airport at Keahole, and Hilo International Airport.* The feasibility study described water scalping as a process that can be used to convert the liquid portion of wastewater into reusable water for irrigation, non-potable uses, and even human consumption. The feasibility study offers thorough recommendations of water scalping options to assist in addressing the limited water resources available in the state without compromising.

Water Reclamation in the Department of Education

DOE schools on Oahu also began to participate in the Small Municipal Separate Storm Sewer System (MS-4) Program, the Environmental Protection Agency's effort to preserve, protect, and improve water resources from polluted storm water runoff. Information on how families can participate is available on several Oahu schools' websites. In addition, many schools have developed storm water management plans and provided curriculum resources to educators, including:

- Niu Valley Middle School[216]
- Pearl Ridge Elementary School[217]
- Kaneohe Elementary School,[218] and
- Hokulani Elementary School[219]

[211] Hawaii Community Foundation, Hawaii Fresh Water Initiative. 2015. A Blueprint for Action: Water Security for an Uncertain Future, 2016-2018. https://www.hawaiicommunityfoundation.org/learning/a-blueprint-for-action-water-security-for-an-uncertain-future-2016-2018.
[212] State of Hawaii, Department of Health, Wastewater Branch, Recycled Water Program. (2016). Retrieved from: http://health.hawaii.gov/wastewater/home/reuse/.
[213] Hawaii Revised Statutes §107-24. Retrieved from: http://capitol.hawaii.gov/measure_indiv.aspx?billtype=HB&billnumber=637&year=2017.
[214] Act 229, Session Laws of Hawaii. (2015). Water Reclamation. Retrieved from: https://www.capitol.hawaii.gov/Archives/measure_indiv_Archives.aspx?billtype=HB&billnumber=1394&year=2015.
[215] Hawaii Revised Statutes §174C-31. Hawaii Water Plan. Retrieved from: https://www.capitol.hawaii.gov/session2016/bills/HB1749_CD1_.pdf.
[216] Niu Valley Middle School. (2017). Sustainability. Retrieved from: http://www.niuvalleymiddle.org/sustainability/.
[217] Pearl Ridge Elementary School. (2017). MS4 Water Pollution Prevention Program. Retrieved from: http://pearlrid.k12.hi.us/.
[218] Kaneohe Elementary School. (2017). MS4 Water Pollution Prevention Program. Retrieved from: https://sites.google.com/a/kaneohe.k12.hi.us/internet/.
[219] Hokulani Elementary School. (2017). MS4 Water Pollution Prevention Program. Retrieved from: https://sites.google.com/a/kaneohe.k12.hi.us/internet/.

3.4 Percentage of Lands and Water Protected for Native Plants and Animals:

Percentage of Watershed Forests Protected:

16% OF HAWAII'S PRIORITY WATERSHEDS ARE PROTECTED

Department of Land and Natural Resources, Division Forestry and Wildlife

Protecting native forests is a critical tool for adapting to climate change's drying effects, and will make Hawaii more resilient in extreme weather events by reducing landslides, flooding, and runoff. Because of this, the Department of Land and Natural Resources (DLNR) elevated watershed protection as its top priority.

Hawaii's Watershed Partnership Program provides technical and financial support for the implementation of the DLNR Management Plans. Watershed partnerships are voluntary alliances of both public and private landowners committed to the common value of protecting forested watersheds for water recharge, conservation, and other ecosystem services through collaborative management. Figure 30 identifies Hawaii's watershed partnerships.

Since 2008, two new watershed partnerships were established, totalling to ten watershed partnerships statewide. Presently these ten statewide partnerships are active on five islands—one partnership in Kauai, two partnerships in Oahu, one partnership in Molokai, three partnerships in Maui, and three partnerships in Hawaii Island. Together, these partnerships involve over 74 private landowners and public agencies that encompass 2.2 million acres of land in the state.[220]

In 2011, the DLNR launched a Watershed Protection Plan entitled, *The Rain Follows the Forest: A Plan to Replenish Hawaii's Source of Water*. This plan identified priority watersheds statewide and consisted of 20% of land area (843,000 acres) of the state; these priority watersheds were determined to play a key role in generating the state's water supply.[221] The 2011 Watershed Protection Plan identified the watershed priority areas that are depicted in Figure 31.[222]

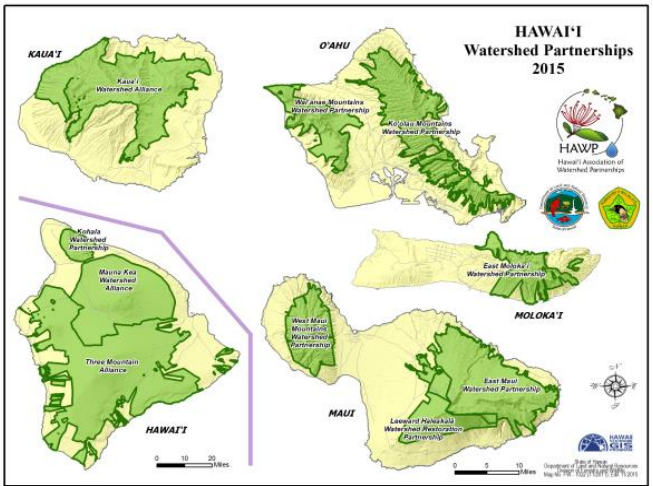


Figure 30. Hawaii Watershed Partnerships. (2015)
Source: Department of Land and Natural Resources, Division of Forestry and Wildlife

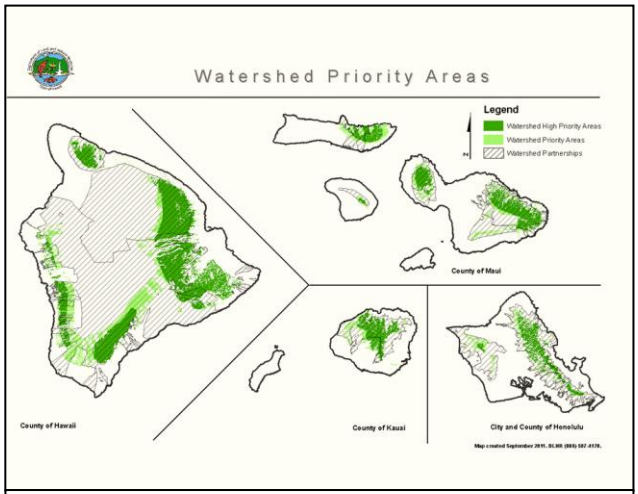


Figure 31. Hawaii's Watershed Priority Areas. (2011)
Source: Department of Land and Natural Resources

[220] Hawaii Association on Watershed Partnerships. (2017). Watershed Partnerships. Retrieved from: http://hawp.org/partnerships/.
[221] State of Hawaii, Department of Land and Natural Resources. (2014). DLNR Accelerating Forest Protection to Secure Hawaii's Water Supply. Retrieved from: http://dlnr.hawaii.gov/blog/2014/02/14/nr14-025/.
[222] State of Hawaii, Department of Land and Natural Resources. (2011). Hawaii's Watershed Priority Areas. Retrieved from: http://dlnr.hawaii.gov/rain/.

The DLNR estimated that 50% of Hawaii's native forests declined over the past two hundred years, resulting in only 90,000 acres (10% of the priority watersheds) of Hawaii's watersheds being protected in 2011.[223] This 2011 plan called to double the protection of the 90,000 acres of priority watershed over the next ten years (protecting 180,000 acres by 2021).[224] Since 2011, the DLNR was able to protect a total of 132,000 priority acres, or 16% of DLNR's priority watershed forests, which increased from the 90,000 acres baseline in 2011. Figure 32 reflects the growth of 42,000 acres of priority watersheds protected within the past six years:

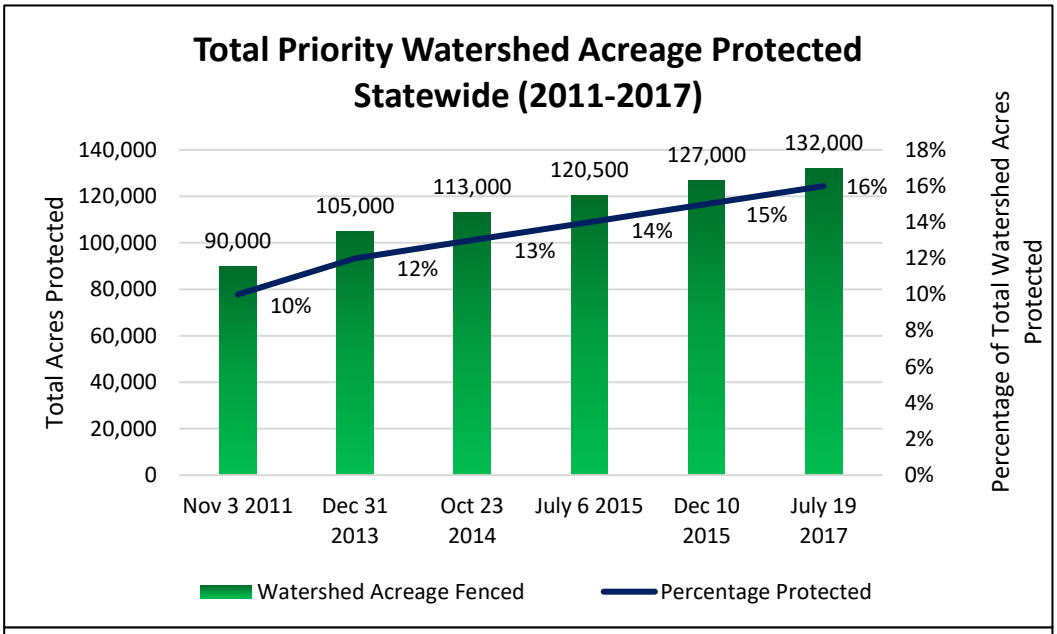


Figure 32. Total Priority Watershed Acreage Protected Statewide (2011-2017). Compiled from data provided by Hawaii State Department of Land and Natural Resources, Division of Forestry and Wildlife.

In 2016, the DLNR committed to conserve and protect 30% of Hawaii's priority watershed forests (253,000 acres) by the target date of 2030 as depicted in Figure 33. DLNR's *Forest Action Plan,* published in 2016, elaborates that this target includes the fencing and removal of non-native hooved animals from targeted core areas, control of invasive plants in priority native forests, prevention and control of wildfires, combating forest diseases and pests, and planting native trees in order to protect watershed forests.[225] To fulfill this 30% target, the DLNR will need to protect the remaining 121,000 acres within the next 12 years.

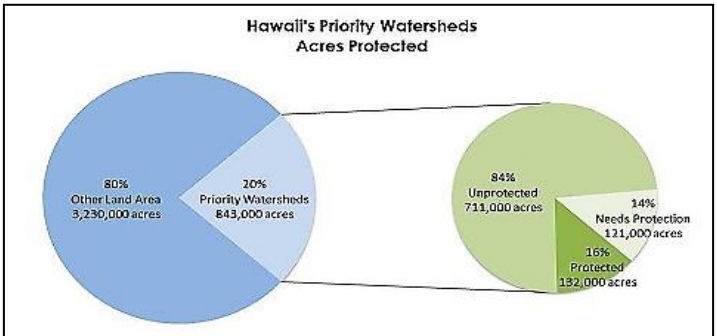


Figure 33. Hawaii's Priority Watersheds Acres Protected (2016). Source: Department of Land and Natural Resources, Forest Action Plan, 2016.

[223] State of Hawaii, Department of Land and Natural Resources. (2014). The Rain Follows the Forest Public Service Announcement. Retrieved from: https://www.youtube.com/watch?v=FiYcvntog74.
[224] University of Hawaii Economic Research Organization. (2012). Financing Watershed Conservation. Retrieved from: http://www.uhero.hawaii.edu/news/view/185.
[225] State of Hawaii, Department of Land and Natural Resources, Division of Forestry and Wildlife. (2016). Hawaii Forest Action Plan. Retrieved from: https://dlnr.hawaii.gov/forestry/files/2013/09/Hawaii-Forest-Action-Plan-2016.pdf.

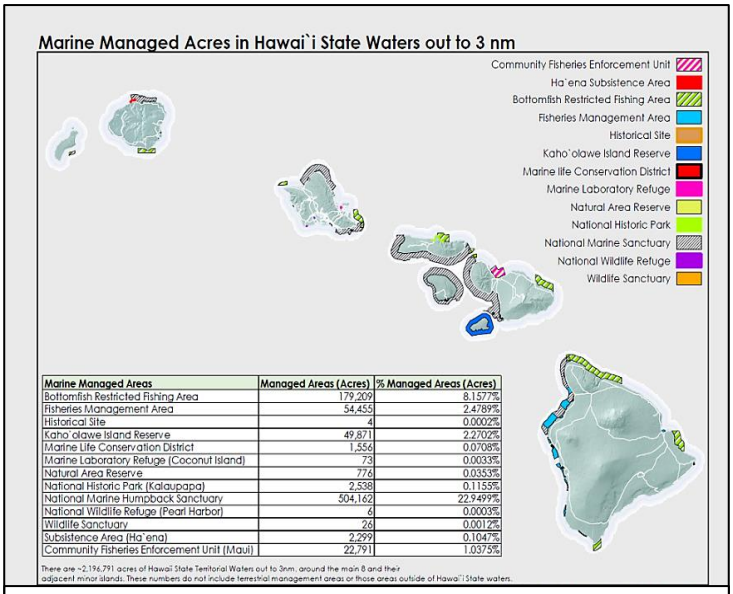
Percentage of Marine Waters Protected:

13.1% OF HAWAII'S MARINE WATERS ARE UNDER ACTIVE MANAGEMENT

Department of Land and Natural Resources, Division of Aquatic Resources

As an island archipelago, Hawaii is particularly dependent on a healthy marine ecosystem. Marine Protected Areas (MPAs) are often described by broad characteristics and classifications, however a U.S. Executive Order defines MPAs as "any area of the marine environment that has been reserved by Federal, State, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein."[226] The intention for this marine protection is to "enhance the conservation of our natural and cultural marine heritage and the ecologically and economically sustainable use of the marine environment for future generations."[227]

According to the United Nations, approximately 5% of oceans are protected globally.[228] The DLNR-Division of Aquatic Resources (DAR) measured as of June 2016; 13.1% of Hawaii's marine waters were under active management.[229]
Figure 34 maps the Federal and State marine managed areas throughout Hawaii.



Marine Managed Areas	Managed Areas (Acres)	% Managed Areas (Acres)
Bottomfish Restricted Fishing Area	179,209	8.1577%
Fisheries Management Area	54,455	2.4789%
Historical Site	4	0.0002%
Kaho`olawe Island Reserve	49,871	2.2702%
Marine Life Conservation District	1,556	0.0708%
Marine Laboratory Refuge (Coconut Island)	73	0.0033%
Natural Area Reserve	776	0.0353%
National Historic Park (Kalaupapa)	2,538	0.1155%
National Marine Humpback Sanctuary	504,162	22.9499%
National Wildlife Refuge (Pearl Harbor)	6	0.0003%
Wildlife Sanctuary	26	0.0012%
Subsistence Area (Ha`ena)	2,299	0.1047%
Community Fisheries Enforcement Unit (Maui)	22,791	1.0375%

There are ~2,196,791 acres of Hawai`i State Territorial Waters out to 3nm, around the main 8 and their adjacent minor islands. These numbers do not include terrestrial management areas or those areas outside of Hawai`i State waters.

Figure 34. Marine Managed Acres in Hawaii State Waters out to 3 NM. Source: NOAA MPA Center, 2014. Hawaii State GIS Program, 2015. Map by: Pacific Cartography for the Hawaii Conservation Alliance, 2016.

The Office of Planning is also in the process of updating Hawaii's Ocean Resources Management Plan (ORMP); this statewide plan sets forth the State's ocean and coastal resource management priorities. The ORMP supports the effective management, beneficial use, protection, and development of the State's coastal zone, which includes all lands of the State and area extending seaward from the shoreline to the limit of the State's police power and management authority, including U.S. territorial sea. The ORMP identifies 11 management priorities for the next five years by identifying responsible agencies and resources and by providing a method for performance measures and reporting. The most recent ORMP was published in 2013, and will be updated as a part of its five year update by 2018.[230]

[226] Executive Order No. 13158, 3 C.F.R. p. 273, (2000).
[227] Ibid.
[228] United Nations, Sustainable Development Goals. (2016). More than 5 per cent of world's oceans now protected with more commitments underway (blog post). Retrieved from: http://www.un.org/sustainabledevelopment/blog/2016/12/more-than-5-per-cent-of-worlds-oceans-now-protected-with-more-commitments-underway-un-environment-wing/.
[229] State of Hawaii, Aloha+ Challenge Dashboard. (2017). Active Marine Management. Retrieved from: https://dashboard.hawaii.gov/en/stat/goals/5xhf-begg/4s33-f5iv/ydtj-mhwg.
[230] State of Hawaii, Office of Planning. (2013). Hawaii Ocean Resources Management Plan. Retrieved from: http://files.hawaii.gov/dbedt/op/czm/ormp/ormp_update_reports/final_ormp_2013.pdf.

Coral Bleaching

Hawaii's coral reefs are a local and national treasure, providing cultural, economic, and recreational opportunities for residents and visitors. A 2004 study found that the average annual value of coral reef ecosystems in Hawaii generates $364 million each year.[231] Hawaii experienced its first statewide mass-bleaching event in 2015 as depicted in Figure 35.

Since 1998 the Earth has experienced three global coral bleaching events. The first in 1998, second in 2010, and 2015 revealed a third global coral bleaching event.[232] Coral Bleaching, as depicted in Figure 36, is a stress response, generally induced by high temperature and light levels, where the coral animal expels zooxanthellae, or photosynthetic dinoflagellates that provide coral polyps with energy. Bleached corals are in a weakened state and will eventually die if temperature and light levels remain high.[233]

In August 2014, thermal stress began to cause bleaching throughout the Hawaiian Archipelago. Of the main Hawaiian Islands, Kauai, Oahu, and Maui observed the majority of coral bleaching in 2014.[234] Coral bleaching was more severe in 2015, with the most extreme bleaching occurring in west Hawaii and Maui, which resulted in extensive coral mortality in west Hawaii and Maui. Although mortality varied among sites, overall average coral cover loss at surveyed sites in west Hawaii was 49.7% as a result of the 2015 bleaching event.[235] Bleaching mortality rates were especially catastrophic for important reef-building species.[236] The coral mortality rate of Maui's corals was estimated at 20 - 40% following the 2015 bleaching event.[237]

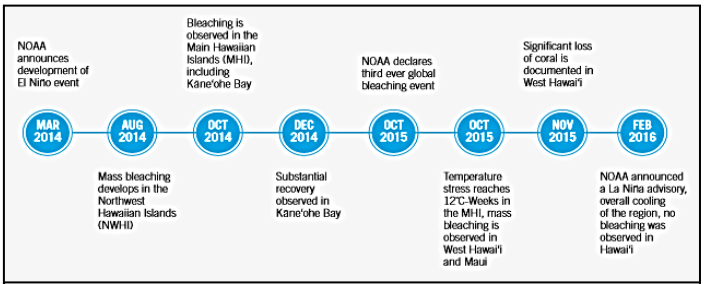


Figure 35. Hawaii's Coral Bleaching Timeline (2014-2016). Source: Department of Land and Natural Resources, Division of Aquatic Resources, Coral Bleaching Recovery Plan, 2017.

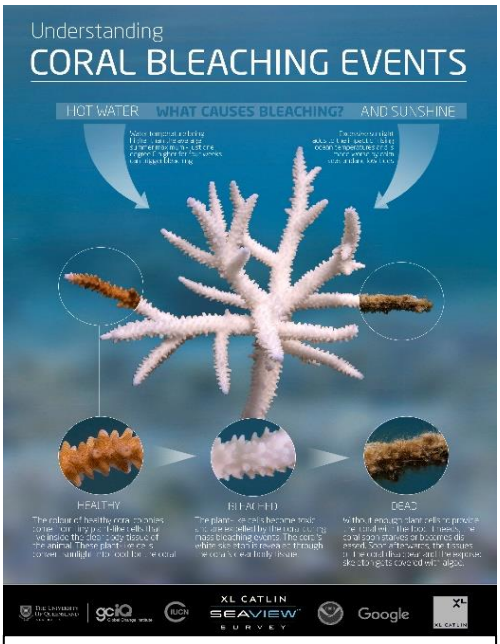


Figure 36. Understanding Coral Bleaching Events. Source: The Ocean Agency/ XL Catlin Seaview Survey, March 2015.

[231] Cesar, H and van Beukering, P. (2004). Economic Valuation of the Coral Reefs of Hawaii. Retrieved from: https://scholarspace.manoa.hawaii.edu/bitstream/10125/2723/1/vol58n2-231-242.pdf.
[232] The Ocean Agency. (2015). The Third Global Coral Bleaching Event 2014/2017. Retrieved from: http://www.globalcoralbleaching.org/.
[233] State of Hawaii, Department of Land and Natural Resources, Division of Aquatic Resources. (2017). Coral Bleaching Recovery Plan: Identifying Management Responses to Promote Coral Recovery in Hawaii. Retrieved from: https://dlnr.hawaii.gov/dar/files/2017/04/Coral_Bleaching_Recovery_Plan_final.pdf.
[234] State of Hawaii, Department of Land and Natural Resources, Division of Aquatic Resources. (2014). Coral Bleaching 2014: Important Findings. Retrieved from:http://dlnr.hawaii.gov/reefresponse/current-rapid-responses/coral-bleaching-2014/.
[235] National Oceanic and Atmospheric Association. (2015). Coral Reef Watch. NOAA Declares Third Ever Global Coral Bleaching Event. Retrieved from: http://www.noaanews.noaa.gov/stories2015/100815-noaa-declares-third-ever-global-coral-bleaching-event.html.
[236] Ibid.
[237] State of Hawaii, Department of Land and Natural Resources, Division of Aquatic Resources. (2017). Coral Bleaching Recovery Plan: Identifying Management Responses to Promote Coral Recovery in Hawaii. Retrieved from: https://dlnr.hawaii.gov/dar/files/2017/04/Coral_Bleaching_Recovery_Plan_final.pdf.

In response to this global coral bleaching event and its adverse effects on the corals throughout the Hawaiian Islands, the DLNR-DAR in partnership with NOAA, the University of Hawaii, and the Nature Conservancy, established and published the *Coral Bleaching Recovery Plan: Identifying Management Responses to Promote Coral Recovery in Hawaii* ("Coral Bleaching Recovery Plan") in March 2017.[238] The plan selected priority areas that identified the highest level of exposure to high ocean temperatures and/or experienced the highest levels of coral mortality following the 2014-2015 global coral bleaching event. These four priority areas are [239]:

1. West Hawaii,
2. Leeward Maui,
3. Kaneohe Bay of Oahu, and
4. North Kauai.

According to the Coral Bleaching Recovery Plan, these priority areas will serve as templates for management intervention, where Hawaii's coral reef scientists and managers have identified potential management implementation obstacles and opportunities, as well as research needs for each of the areas in the plan.

Conservation Education

Corresponding to this indicator and the strategic actions under Goal 3, the 2008 Hawaii 2050 Sustainability Plan urged the strengthening of funding public and private conservation education. Unfortunately, due to the lack of a permanent government sustainability coordinating entity over the previous decade, there was no active coordination measuring the funding of public and private conservation education for the past ten years.

This report will measure the strength of the Hawaii Youth Conservation Corps, which is a dedicated program through Chapter 193, Part IV of the Hawaii Revised Statutes, that authorizes the State of Hawaii through the Department of Land and Natural Resources, and other state agencies to design programs to provide healthful outdoor training and employment for young persons and to advance the conservation, development, and management of natural resources and recreational areas.[240]

Figure 37 reflects the development and impact of State funding invested in and the corresponding total volunteer hours invested in the Hawaii Youth Conservation Corps program managed between DLNR-Division of Forestry and Wildlife (DOFAW) and KUPU since 2008.

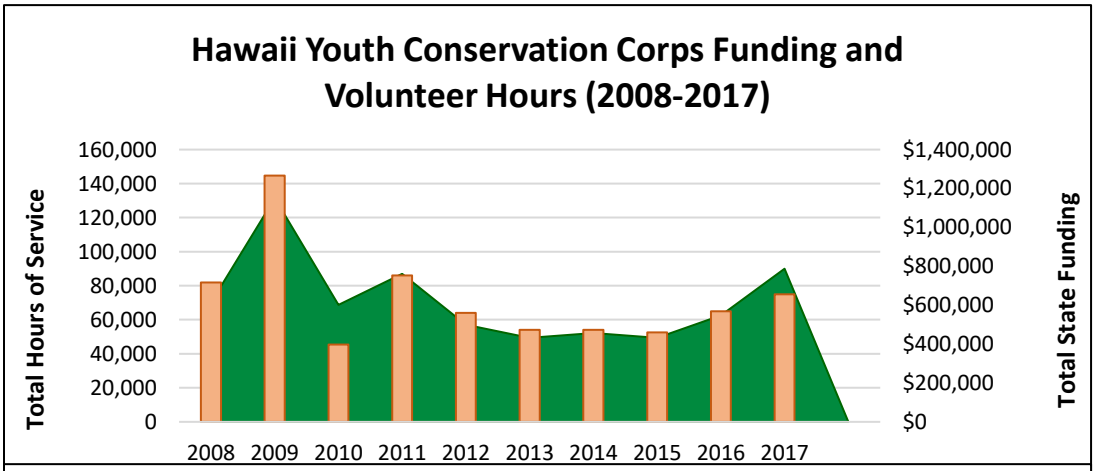


Figure 37. Hawaii Youth Conservation Corps Funding and Volunteer Hours (2008-2017). Compiled from data provided by the Department of Land and Natural Resources, Division of Forestry and Wildlife and KUPU.

[238] State of Hawaii, Department of Land and Natural Resources, Division of Aquatic Resources. (2017). Coral Bleaching Recovery Plan: Identifying Management Responses to Promote Coral Recovery in Hawaii. Retrieved from: https://dlnr.hawaii.gov/dar/files/2017/04/Coral_Bleaching_Recovery_Plan_final.pdf.

[239] Ibid.

[240] Hawaii Revised Statutes Chapter 193, Part IV. Hawaii Youth Conservation Corps. Retrieved from: https://www.capitol.hawaii.gov/hrscurrent/Vol03_Ch0121-0200D/HRS0193/HRS_0193-0031.htm.

3.5 Percentage of Leadership in Energy and Environmental Design (LEED)-Type Building Permits Issued:

Due to the lack of a permanent government sustainability coordinating entity, there was no active coordination measuring the percentage of LEED-type building permits issued statewide over the past ten years.

41 OF THE **179** LEED-CERTIFIED BUILDINGS THROUGHOUT HAWAII ARE OWNED BY THE STATE GOVERNMENT

U.S. Green Building Council

In 2006, the State enacted Act 96 codified as §196-9 of the Hawaii Revised Statutes, to direct state agencies to implement, to the extent possible, the following goals [241]:

1. Design and construct buildings meeting the LEED silver or two green globes rating system, or another comparable state-approved, nationally recognized, and consensus-based guideline, standard, or system (except if these guidelines interferes with an emergency shelter).
2. Incorporate energy-efficiency measures to prevent heat gain in residential facilities up to three-stories in height. Where possible, buildings shall be oriented to maximize natural ventilation and day-lighting without heat gain and to optimize solar for water heating. This provision shall apply to new residential facilities built using any portion of state funds or is located on state lands.
3. Install solar water heating systems where it is cost-effective.
4. Implement water and energy efficiency practices in operations to reduce waste and increase conservation.
5. Incorporate principals of waste minimization and pollution prevention, such as reducing, revising, and recycling as a standard operating practice in programs, include programs for waste management in construction and demolition projects and office paper and packaging recycling programs.
6. Use life cycle cost-benefit analysis to purchase energy efficient equipment such as Energy Star products and use utility rebates, where available, to reduce purchase and installation costs.
7. Procure environmentally preferable products, including recycled and recycled-content, bio-based, and other resource-efficient products and materials.

The US Green Building Council (USGBC) provides LEED certification and is the most widely used green building system in the world. LEED provides a framework for the design, construction, operation, and maintenance of green buildings, homes, and neighborhoods that aim to help building owners and operators to be environmentally responsible and use resources efficiently and sustainably.

USGBC's 2017 State Market Brief identified only 179 LEED certified buildings statewide. Of these 179 certified buildings, 41 are owned by the State of Hawaii, 18 are owned by local counties, and 116 are owned by the Federal Government.[242] Figure 38 depicts the growth rate of LEED certified buildings statewide from 2008 to 2017.

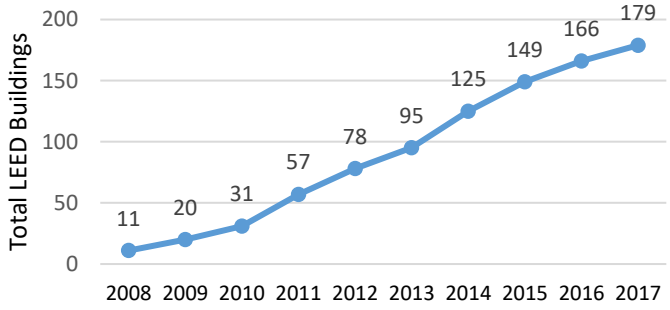


Figure 38. LEED Certified Buildings Statewide (2008-2017).
Source: USGBC State Market Brief: Hawaii

[241] Hawaii Revised Statutes §196-9. Energy Efficiencies and Environmental Standards for State Facilities, Motor Vehicles, and Transportation Fuel. Retrieved from: http://www.capitol.hawaii.gov/hrscurrent/Vol03_Ch0121-0200D/HRS0196/HRS_0196-0009.htm.
[242] U.S. Green Building Council. (2017). State Market Brief: Hawaii. Retrieved from: https://www.usgbc.org/advocacy/state-market-brief.

3.6 Percentage of New Urban Developments Consistent with "Smart Growth" Principles:

Unfortunately, due to the lack of a permanent government sustainability coordinating entity over the previous decade, no measurements of the percentage of new urban developments consistent with "smart growth" principals were conducted over the past ten years; however, this report will summarize the recent land use planning updates through county general plans and community plans, as well as provide recommendations to improve sustainable land use planning.

Planning for sustainability is the defining challenge of the twenty-first century.[243] The American Planning Association explained in a recent Planning Advisory Service (PAS) 578, *Sustaining Places: Best Practices for Comprehensive Plans* that as the leading policy document guiding the long-range development of local jurisdictions across the country; the comprehensive plan has a critical role to play in meeting challenges such as resource depletion, climate instability, and economic and social disparities. Into the twentieth century, the typical comprehensive plan was a general policy document focused on land use and physical development. This model began to change toward the close of the century in response to societal changes and trends in planning practice.

The American Planning Association identified key trends that likely will significantly affect comprehensive planning practice in the twenty-first century [244]:

- **Resilience:** The increasing frequency and impacts of natural disasters, as well as severe economic downturns, have highlighted the need for communities to become more resilient— in other words, they need the ability to recover from disturbance and change.
- **Systems thinking:** The traditional model of separate topical elements is being replaced by an approach that views these topics as complex systems whose interactions determine the form and function of an even more complex system—the community as a whole.
- **Community engagement**: Rapid advances in digital technology are transforming the ways citizens can be involved in the comprehensive planning process. At the same time, a critical need exists to reach groups that are traditionally underrepresented in the process.
- **Equity:** Increasing inequality—not just in economic status but also in basic quality-of-life issues such as health outcomes and vulnerability to disasters—is a major national and global concern.
- **Implementation:** In a time of fiscal constraints and questioning of the role of government, successful implementation is vital to establish the value of planning. For the comprehensive plan, this means establishing priorities, responsibilities, and timeframes; effectively allocating resources; developing new implementation models; using targets and metrics to monitor progress; and communicating stories of success.
- **Adaptation:** Conditions that used to be considered stable, such as the climate, resource availability and costs, and the local employment base, are increasingly subject to forces beyond the control of local governments. Such uncertainties call for an adaptive approach that uses monitoring and feedback mechanisms (a form of systems thinking) to adjust implementation programs on an ongoing basis.

[243] Godschalk, David and William Anderson. (2012). Sustaining Places: The Role of the Comprehensive Plan (PAS Report 567). Chicago: American Planning Association. Retrieved from: https://www.planning.org/publications/report/9026891/.
[244] Godschalk, David and David Rouse. (2015). Sustaining Places: Best Practices for Comprehensive Plans (PAS Report 578). Chicago: American Planning Association. Retrieved from: https://www.planning.org/publications/report/9026901/.

Some communities and regions in Hawaii have adopted certain sustainability land use practices through either their own best practices research or through integrating smart growth, green infrastructure, open space, storm water management, water recharge opportunities, and urban growth boundaries into their comprehensive plans. These long-range plans are aimed at guiding the community by balancing social equity, environmental, and economic conditions while tying together the community's goals, strategies, and implementation actions.

Adopting a separate sustainability plan, however, may integrate more resource and use planning, including: energy-efficiency, land use, transportation, water efficiency, water reuse, green infrastructure with water recharge opportunities, public health, recycling, renewable energy, economic development, and more.[245] When integrated, these planning principals help to improve the community's quality of life for generations to come.

Over the past decade, Hawaii's counties have updated their respective general and community land use plans. Many of these counties' general plans have reiterated the need for protecting the islands' agricultural lands for productive and sustainable agricultural use while balancing the need for affordable housing to accommodate forecasted population growth.

The following summary will identify whether sustainable land use best practices (for example, integrating smart growth, the use of green infrastructure in built environments to reduce impermeable surfaces and generate water recharge opportunities, or planning for climate change) were included in Hawaii's comprehensive plans and community plans.

- **Kauai County General Plan**[246]**:** Draft submitted June 2017. The plan establishes core visions and goals of a sustainable island, a healthy and resilient people, a unique and beautiful place, and an equitable place with opportunity for all. The draft General Plan highlights the importance of sustainable development for Kauai since "many feel the island is near or at carrying capacity…There is also concern that Kauai's natural resources and ecosystems are being irreversibly stressed or depleted. Addressing these issues sustainably means frankly assessing the existing conditions and identifying the tools and resources available to provide for their sustainable use and protection into the future." (p.33)

  The draft Kauai County General Plan establishes 19 policies to guide growth, which center around sustainability planning principles as shown in Figure 39.

Figure 39. Kauai Draft General Plan Policies to Guide Growth
Source: Kauai County Planning Department

[245]Godschalk, David and David Rouse. (2015). Sustaining Places: Best Practices for Comprehensive Plans (PAS Report 578). Chicago: American Planning Association. Retrieved from: https://www.planning.org/publications/report/9026901/.
[246] County of Kauai, Planning Department. (2017). Kauai County Draft General Plan. Retrieved from: http://plankauai.com/.

- **South Kauai Community Plan**[247]**:** Adopted in 2015, the plan discussed sustainability principles including walkable mixed use communities, support for a comprehensive water strategy, runoff and erosion prevention, renewable energy generation, climate change mitigation strategies, eco-friendly tourism, local food and sustainable farming practices, and important agricultural land designations, among others.
- **East Kauai Development Plan**[248]**:** Update is underway.
- **Lihue Community Plan**[249]**:** Adopted in 2015, the plan incorporated seven recommendations for policies within the plan to be: sustainable, compact, connected, place-based, mixed use, multi-modal, and vital and attractive. The plan focused on smart growth and sustainability principles and recommends a Lihue urban edge boundary, increasing the availability of LEED-certified buildings, adding a materials recycling facility, restoring storm irrigation to reduce runoff, enhancing area walkability and bikeability, identifying important agricultural land designations, and recommending mitigation and adaptation strategies for future climate change.

- **City and County of Honolulu, Oahu 2035:** The General Plan Focused Update is currently underway. It will review the critical issues of growth, development, and quality of life that island residents are most concerned about, including regional population, economic health, affordable housing, and sustainability. The City and County's Department of Planning and Permitting (DPP) and its consultant released the Second Public Review Draft of the General Plan in February 2017. There was a public comment period until May 7, 2017. The DPP anticipates submitting a final plan in March 2018 to the Planning Commission, which will hold a public hearing before making a recommendation to the City Council for review and adoption.[250]
  - **Honolulu General Plan Update: Sustainability Trend Report**, **2011**[251]: Was published to present information about the concept of sustainability as it relates to the City & County of Honolulu's General Plan. The report recommended the City and County of Honolulu's General Plan should include goals and objectives related to sustainability as a broad position on sustainability, and not be limited to climate change initiatives.
  - **Central Oahu Sustainable Communities Plan**[252]**:** Submitted to City Council for Adoption in October 2016, the plan sought to protect agricultural lands, open space, and natural, historic, and cultural resources; build master planned residential communities that support walking, biking, and transit use, and design communities to reduce automobile usage, provide adequate infrastructure to meet the needs of new and existing development.
  - **East Honolulu Sustainable Communities Plan**[253]: Update is underway. This plan's update includes several climate adaptation workshops focusing on climate change and sea level rise planning, and green infrastructure planning.

[247] County of Kauai, Planning Department. (2015). South Kauai Community Plan. Retrieved from: http://www.kauai.gov/Government/Departments-Agencies/Planning-Department/Long-Range-Division/South-Kauai-Community-Plan.
[248] County of Kauai, Planning Department. East Kauai Development Plan. Retrieved from: http://www.kauai.gov/Government/Departments-Agencies/Planning-Department/Long-Range-Division/East-Kauai-Development-Plan.
[249] County of Kauai, Planning Department. (2015). Lihue Community Plan. Retrieved from: http://www.kauai.gov/Government/Departments-Agencies/Planning-Department/Long-Range-Division/Lihue-Community-Plan-LCP.
[250] City and County of Honolulu. (2017). Oahu General Plan Update Process Timeline. Retrieved from: http://honoluludpp.org/Portals/0/pdfs/planning/generalplan/Schedule%2012-28-17.pdf.
[251] City and County of Honolulu. (2011). Honolulu General Plan Update. Sustainability Trend Report. Prepared by Herbert Hastart & Fee. Retrieved from: http://www.honoluludpp.org/Portals/0/pdfs/planning/generalplan/GPUpdate/TrendReports/Sustainability.pdf.
[252] City and County of Honolulu, Department of Planning and Permitting. (2016). Central Oahu Communities Plan. Retrieved from: http://www.honoluludpp.org/Portals/0/pdfs/planning/CentralOahu/2016%20COSCP%20Proposed%20Clean.pdf.
[253] City and County of Honolulu, Department of Planning and Permitting. (2017). East Honolulu Sustainable Communities Plan. Retrieved from: http://www.honoluludpp.org/Planning/DevelopmentSustainableCommunitiesPlans/EastHonoluluPlan.aspx.

- **Ewa Development Plan**[254]**:** Adopted July 2013, the plan sought to integrate principles of sustainability into decision-making processes.
- **Koolau Loa Sustainable Communities Plan**[255]**:** Pre-final revised plan submitted to the City Council in 2012. The plan sought to integrate principles of sustainability into decision-making processes.
- **Koolau Poko Sustainable Communities Plan**[256]**:** Adopted August 2017, the plan called for protection of the communities' natural, scenic, cultural, historic and agricultural resources, while addressing the need to improve and replace, as necessary, the region's aging infrastructure systems.
- **North Shore Sustainable Communities Plan**[257]**:** Adopted May 2011, the plan sought to integrate principles of sustainability into decision-making processes.
- **Waianae Sustainable Communities Plan**[258]**:** Adopted March 2012, the plan sought to integrate principles of sustainability into decision-making processes.
- **Primary Urban Center Development Plan**[259]**:** Last adopted 2004, the update is underway.

- **Hawaii County General Plan Comprehensive Review:** Started in February 2015, the plan will take an estimated time frame of three-years to complete. The Comprehensive Review noted that in Hawaii County, everything that has transpired; including population growth, natural disasters, technological advancements, and sustainability efforts, is being considered in the General Plan. The County Planning Department has also updated the following community development plans to consider growth management and sustainable land uses, including preserving agricultural lands:
  - **Envision Downtown Hilo 2025**[260]**:** Five Year Action Plan Update was submitted November 2010.
  - **Hamakua Community Development Plan**[261]**:** Draft undergoing final recommendations for revision and future adoption.
  - **Kau Community Development Plan**[262]**:** Adopted by Hawaii County Council in October 2017.
  - **Kona Community Development Plan**[263]**:** The update is underway, the Kona CDP Action Committee was created.
  - **North Kohala Community Development Plan**[264]**:** The update is underway, the North Kohala CDP Action Committee was created.
  - **South Kohala Community Development Plan**[265]**:** The update is underway, the South Kohala CDP Action Committee was created.
  - **Puna Community Development Plan**[266]**:** Adopted by Hawaii County Council in 2008, the plan was last amended December 2011.

[254] City and County of Honolulu, Department of Planning and Permitting. (2013). Ewa Development Plan. Retrieved from: http://www.honoluludpp.org/Portals/0/pdfs/planning/ewa/ewa5yr/Ewa_DP_2013_securedcopy.pdf.
[255] City and County of Honolulu, Department of Planning and Permitting. (2012). Koolau Loa Sustainable Communities Plan. Retrieved from: http://www.honoluludpp.org/Portals/0/pdfs/planning/Koolauloa/Kloa5Yr/Final/Final_KLSCP(Dec2012).pdf.
[256] City and County of Honolulu, Department of Planning and Permitting. (2017). Koolau Poko Sustainable Communities Plan. Retrieved from: http://www.honoluludpp.org/Portals/0/pdfs/planning/Koolaupoko/2017-08.KPSCP.pdf.
[257] City and County of Honolulu, Department of Planning and Permitting. (2011). North Shore Sustainable Communities Plan. Retrieved from: http://www.honoluludpp.org/Portals/0/pdfs/planning/NorthShore/NSSCP_May_2011.pdf.
[258] City and County of Honolulu, Department of Planning and Permitting. (2012). Waianae Sustainable Communities Plan. Retrieved from: http://www.honoluludpp.org/Portals/0/pdfs/planning/Waianae/2012WaianaeSCPReduced.pdf.
[259] City and County of Honolulu, Department of Planning and Permitting. (2004). Primary Urban Center Development Plan. Retrieved from: http://www.honoluludpp.org/Portals/0/pdfs/planning/PUC/PrimaryUrbanCenterDP.pdf.
[260] County of Hawaii, Planning Department. (2010). Envision Downtown Hilo 2025. Retrieved from: http://www.hawaiicounty.gov/pl-edh2025.
[261] County of Hawaii, Planning Department. Hamakua Community Development Plan. Retrieved from: http://www.hawaiicountycdp.info/hamakua-cdp.
[262] County of Hawaii, Planning Department. (2017). Kau Community Development Plan. Retrieved from: http://www.hawaiicountycdp.info/kau-cdp.
[263] County of Hawaii, Planning Department. (2017). Kona Community Development Plan. Retrieved from: http://www.hawaiicountycdp.info/north-and-south-kona-cdp.
[264] County of Hawaii, Planning Department. (2017). North Kohala Community Development Plan. Retrieved from: http://www.hawaiicountycdp.info/north-kohala-cdp.
[265] County of Hawaii, Planning Department. South Kohala Community Development Plan. Retrieved from: http://www.hawaiicountycdp.info/south-kohala-cdp.
[266] County of Hawaii, Planning Department. (2011). Puna Community Development Plan. Retrieved from: http://www.hawaiicountycdp.info/puna-cdp/draft-plan-recommendations.

- **Maui Countywide Policy Plan**[267]**:** Adopted in 2010, the plan acts as an overarching values statement and provides a policy framework for the Maui Island Plan.
- **Maui Island Plan**[268]**:** Adopted in 2012, the plan acknowledged the need to preserve island agriculture lands while balancing directed growth for new development.

    - **Lanai Community Plan**[269]**:** Adopted in 2016, the plan seeks to "establish Lanai as a model sustainable island to be known for its bold integration of innovative green policies into a traditional rural island community" (p.2-3). The plan identified the need for a sustainable population for the island, and the need to increase the island's food security. Increasing renewable energy sources, the goal to recycle 100% of wastewater for irrigation while exploring options for reuse of household greywater for lawn and garden irrigation were also highlighted.
    - **Molokai Community Plan**[270]**:** Draft submitted to the Maui County Council, 2016, the plan acknowledges the need for sustainability and climate change planning and identifies that the current and future water demand exceeds the sustainable water supply as of 2016. The plan recommends the use of green infrastructure and technology and sustainable building practices as solutions which need to be implemented to restore natural systems to improve the island's resiliency to climate change. The plan recognizes and supports sustainable agricultural, forestry, and game best management practices, and sustainable subsistence fishery management.
    - **Kihei-Makena Community Plan**[271]**:** Last adopted in 1998.
    - **Paia-Haiku Community Plan**[272]**:** Last adopted in 1995.
    - **Wailuku-Kahului Community Plan**[273]**:** Last adopted in 2002.
    - **Makawao-Pukalani-Kula Community Plan**[274]: Last adopted in 1996.
    - **Hana Community Plan**[275]**:** Last adopted in 1994.
    - **West Maui Community Plan**[276]**:** Last adopted in 1996.

[267] County of Maui, Planning Department. (2010). Countywide Policy Plan. Retrieved from: https://www.mauicounty.gov/420/Countywide-Policy-Plan.
[268] County of Maui, Planning Department. (2012). Maui Island Plan. Retrieved from: https://www.mauicounty.gov/1503/Maui-Island-Plan.
[269] County of Maui, Planning Department. (2016). Lanai Community Plan. Retrieved from: https://hi-mauicounty2.civicplus.com/DocumentCenter/View/105983.
[270] County of Maui, Planning Department. (2016). Molokai Community Plan. Retrieved from: https://www.mauicounty.gov/DocumentCenter/View/103666.
[271] County of Maui, Planning Department. (1998). Kihei-Makena Community Plan. Retrieved from: https://www.mauicounty.gov/DocumentCenter/Home/View/1712.
[272] County of Maui, Planning Department. (1995). Paia-Haiku Community Plan. Retrieved from: https://www.mauicounty.gov/DocumentCenter/Home/View/1717.
[273] County of Maui, Planning Department. (2002). Wailuku-Kahului Community Plan. Retrieved from: https://www.mauicounty.gov/DocumentCenter/Home/View/1717.
[274] County of Maui, Planning Department. (1996). Makawao-Pukalani-Kula Community Plan. Retrieved from: https://www.mauicounty.gov/DocumentCenter/Home/View/1714.
[275] County of Maui, Planning Department. (1994). Hana Community Plan. Retrieved from: https://www.mauicounty.gov/DocumentCenter/Home/View/1710.
[276] County of Maui, Planning Department. (1996). West Maui Community Plan. Retrieved from: https://www.mauicounty.gov/DocumentCenter/Home/View/1720.

Upon review, this report finds that sustainable land use coordination could be improved through stronger and clearer statewide land use policies as they relate to Hawaii's sustainability. The following laws and land use plans could be integrated to improve sustainability land use planning through the comprehensive plans:

- **Hawaii's Important Agricultural Land (IAL) Law** (Hawaii Revised Statutes Chapter 205, Part III)[277]: Requires the counties to designate important agricultural lands; however as of 2017, only the County of Kauai completed its *Important Agricultural Lands Study*.[278] The City and County of Honolulu's mapping of Oahu's Important Agricultural Lands is currently underway, with the most recent community meeting held on November 2017.[279]

  Future sustainability policies and plans focusing on Hawaii land use could inventory the progress and total acreage of Hawaii's statewide Important Agricultural Lands. Future County General Plans and Community Plans could document the intended and future use of Important Agricultural Lands.

- **Periodic Review of Land Use Districts:** Five year updates could be performed by the Office of Planning pursuant to §205-18 of the Hawaii Revised Statutes to undertake a review of the classification and districting of all lands in the State. In this five year boundary review, the Office of Planning could focus on efforts in reviewing the Hawaii State Plan, county general plans, and county development and community plans. Upon completion of the five year boundary review, the Office of Planning is required to submit a report of the findings to the Land Use Commission.[280] This will ensure thorough land use coordination toward Hawaii's sustainable future and assist Hawaii's Land Use Commission to determine and coordinate future urban, agricultural, conservation, and rural land use designations.

- **Transit-Oriented Development Plans**[281]: Can identify the improvement and addition of green infrastructure, stormwater runoff and groundwater recharge, the use of permeable surfaces, mixed-use, pedestrian and bike friendly access, as well as complete street opportunities.

- **Complete Street Plans**[282, 283]**:** Can identify opportunities to improve pedestrian and bike access, green infrastructure, and the use of permeable surfaces within the urban environment.

[277] Hawaii Revised Statutes Chapter 205, Part III. Important Agricultural Lands Law.
[278] County of Kauai, Planning Department. (2015). Important Agricultural Lands Study. Retrieved from: https://sites.google.com/site/kauaiial/.
[279] City and County of Honolulu, Department of Planning and Permitting. (2017). Oahu Important Agricultural Lands. Retrieved from: http://mapoahuagland.com/meetings-announcements/presentations/.
[280] Hawaii Revised Statutes §205-18. Periodic Review of Land Use Districts. Retrieved from: https://www.capitol.hawaii.gov/hrscurrent/Vol04_Ch0201-0257/HRS0205/HRS_0205-0018.htm.
[281] City and County of Honolulu, Department of Planning and Permitting, TOD Honolulu. Retrieved from: https://www.honolulu.gov/tod.
[282] City and County of Honolulu, Department of Transportation Services, Honolulu Complete Streets. (2017). What are Complete Streets? Retrieved from: http://www.honolulu.gov/completestreets.
[283] State of Hawaii, Department of Health, Healthy Hawaii Initiative. (2017). Community Design and Active Living. Retrieved from: http://health.hawaii.gov/physical-activity-nutrition/home/community-design-active-living/.

3.7 Percentage of Shorelines Threatened or Retreating; and Rate of Loss:

The U.S. Global Change Research Program's Fourth National Climate Assessment - Climate Science Special Report was recently published in 2017 warning about the sea level rise effects of Global climate change for Hawaii and other Pacific Islands which are at risk for amplified rising sea levels due to their distance from the melting land ice of glaciers and ice sheets through static-equilibrium effects.[284]

70% OF HAWAII'S BEACHES ARE UNDERGOING CHRONIC EROSION

Department of Land and Natural Resources, Impacts of Sea Level Rise

The National Oceanic and Atmospheric Administration has actively collected data and monitored mean sea level trends, interannual variations, and annual seasonal cycles throughout Hawaii.

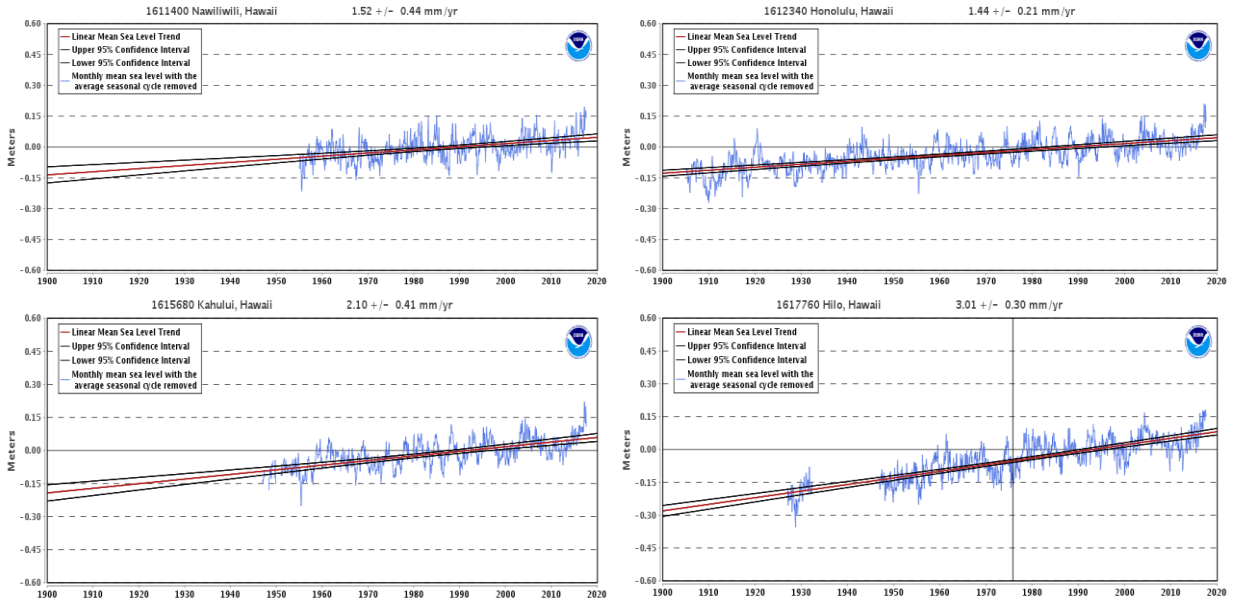


Figure 40. Mean Sea Level Trends of Nawiliwili, Kauai (top left); Honolulu, Oahu (top right); Kahului, Maui (bottom left); Hilo, Hawaii (bottom right) (1900-2017).
Source: National Oceanic and Atmospheric Association

Climate Change Adaptation Priority Guidelines for the Hawaii State Plan

Recognizing the potentially serious effects of climate change for Hawaii, the State enacted Act 286 in 2012, codified as §226-109 of the Hawaii Revised Statutes, as a set of climate change adaptation priority guidelines within the Hawaii State Planning Act to prepare the State to address the impacts of climate change, including the areas of agriculture, conservation lands, coastal and nearshore marine areas, natural and cultural resources, education, energy, higher education, health, historic preservation, water resources, and the built environment such as housing, recreation, and transportation.[285] Figure 40 provides a compilation of the National Oceanic and Atmospheric Association's (NOAA's) analysis of rising mean sea level trends for Kauai, Oahu, Maui, and Hawaii Islands.

[284] Sweet, W.V., R. Horton, R.E. Kopp, A.N. LeGrande, and A. Romanou, 2017: Sea level rise. In: *Climate Science Special Report: Fourth National Climate Assessment, Volume I* [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 333-363, doi: 10.7930/J0VM49F2.
[285] Hawaii Revised Statutes §226-109. (2012). Climate Change Adaptation Priority Guidelines. Retrieved from: http://www.capitol.hawaii.gov/hrscurrent/Vol04_Ch0201-0257/HRS0226/HRS_0226-0109.htm.

Interagency Climate Adaptation Committee

Act 83 was enacted in 2014 to implement the climate change policy guidelines directed in §226-109 of the Hawaii Revised Statutes by directing the Office of Planning and the Department of Land and Natural Resources (DLNR) to form an Interagency Climate Adaptation Committee (ICAC). This committee was tasked to identify major areas of sea level rise impacts, which will affect Hawaii through 2050, including any economic ramifications of sea level rise, and recommend the planning, management, and adaptation for hazards associated with increasing sea level rise. The ICAC was required by law to publish the analysis of their research by December 2017.[286]

Through the ICAC's research, the State found that coastal erosion will exacerbate flooding and inundation resulting in the permanent loss of beaches and dry land, which will become submerged at increasing rates due to sea level rise. The ICAC explains, beaches, dunes and other coastal environments, in their natural state, can provide effective protection from impacts of high waves and storms.[287] Statewide, the ICAC found that 70% of Hawaii's beaches are undergoing chronic erosion, meaning the shoreline is quickly retreating.[288]

Hawaii Climate Change Mitigation and Adaptation Commission

Recently the ICAC evolved into the Hawaii Climate Change Mitigation and Adaptation Commission ("Climate Commission") in 2017 through the update of Chapter 225P of the Hawaii Revised Statutes via Act 32. This Commission broadened the ICAC to include multiple agencies, counties, and legislators to serve to provide policy direction, facilitation, coordination, and planning statewide. This Climate Commission is tasked to establish climate change mitigation and adaptation strategies and goals to help guide the planning and implementation statewide to monitor and forecast climate change related impacts by 2023.[289] Further and in-depth information on Hawaii's threatened and retreating shoreline may be found in the Hawaii Climate Commission's (formerly ICAC) Hawaii Sea Level Rise Vulnerability and Adaptation Report.[290]

Managed Retreat

In March 2017, the Office of Planning's Coastal Zone Management program initiated an exploratory study to generate discussion around the feasibility of managed retreat as a potential strategy for climate change adaptation for Hawaii. Managed retreat is a coastal management strategy that, through the relocation of structures and infrastructure near the shoreline, allows the shoreline to move inland, unimpeded. This approach may allow some erosion control measures using soft-stabilization techniques to prolong the life of shorefront buildings and other infrastructure for the short term.[291] This exploratory study will generate a background report, case studies covering different development types, discussions at a symposium, and provide analysis through a final report in 2018 on the feasibility of implementing managed retreat in Hawaii.

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[286] Act 83, Session Laws of Hawaii. (2014). Climate Adaptation. Retrieved from: http://www.capitol.hawaii.gov/Archives/measure_indiv_Archives.aspx?billtype=HB&billnumber=1714&year=2014.

[287] State of Hawaii, Hawaii Climate Change Mitigation and Adaptation Commission. (2017). Hawaii Climate Adaptation Portal, Impacts of Sea Level Rise. Retrieved from: http://climateadaptation.hawaii.gov/impacts-of-sea-level-rise/.

[288] National Oceanic and Atmospheric Administration. (2015). Sea Level Rise Trends. Retrieved from: https://tidesandcurrents.noaa.gov/sltrends/sltrends.html.

[289] Act 32, Session Laws of Hawaii. (2017). Hawaii Revised Statutes §225P, Hawaii Climate Change Mitigation and Adaptation Initiative. http://www.capitol.hawaii.gov/Archives/measure_indiv_Archives.aspx?billtype=SB&billnumber=559&year=2017.

[290] 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, under the State of Hawaii Department of Land and Natural Resources Contract No: 64064. Retrieved from: https://climateadaptation.hawaii.gov/wp-content/uploads/2017/12/SLR-Report_Dec2017.pdf.

[291] National Oceanic and Atmospheric Association. (2007). Ocean and Coastal Resource Management, Managed Retreat Strategies. Retrieved from: https://web.archive.org/web/20150905055350/http://coastalmanagement.noaa.gov/initiatives/shoreline_ppr_retreat.html, or http://www.adaptationclearinghouse.org/resources/managed-retreat-strategies.html.

3.8 Pollution Level in Streams, Aquifers and Coastal Waters:

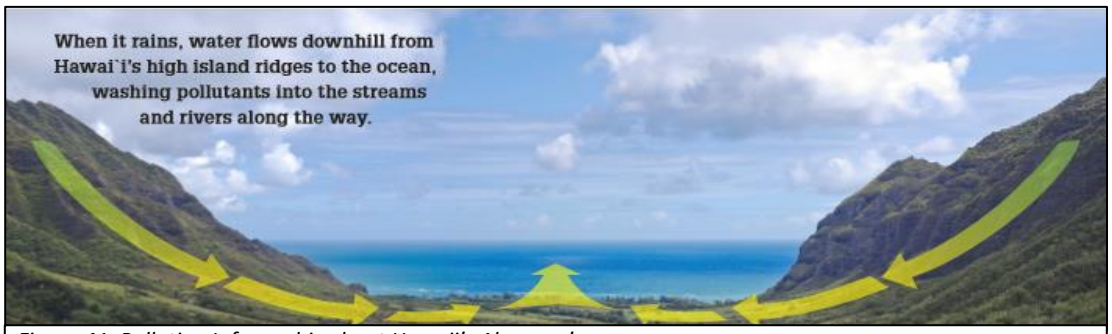


Figure 41. Pollution Infographic about Hawaii's Ahupuaa's.
Source: Hawaii Department of Health, Clean Water Branch, Polluted Runoff Control Program.

Polluted runoff is the greatest threat to Hawaii's surface and ground waters, making them unsafe for drinking, swimming, fishing, and other recreational uses. Some polluted runoff is from natural sources; however, most polluted runoff results from human activities on the land and in the water.

The State's Department of Health's Clean Water Branch manages Hawaii's Polluted Runoff Control Program, administers the State's Non-Point Source (NPS) pollution management program, and develops the State's NPS Management Plan to implement watershed-specific strategies to control NPS pollution, also known as runoff pollution.

Hawaii's NPS Management Plan guides the State's NPS management efforts by establishing goals, objectives, strategies, and milestones directed at preventing and reducing NPS pollution and improving water quality.[292] The NPS Management Plan also advances the State's efforts to obtain full approval of Hawai'i's Coastal Nonpoint Pollution Control Program (CNPCP), which was established under Section 6217 of the Coastal Zone Act Reauthorization Amendments (CZARA) of 1990. The CNPCP is administered jointly by the DOH and by the Office of Planning's Coastal Zone Management (CZM) program.[293] Both the Polluted Runoff Control program and the CNPCP seek to prevent and reduce polluted runoff to protect and improve Hawaii's water quality.

The most recent NPS Management Plan was updated in 2015 to provide a more coordinated approach among federal, state, and local water quality agencies to implement NPS projects and target pollutants and their sources more effectively between 2015 and 2020.[294]

[292] State of Hawaii Department of Health, Clean Water Branch, Polluted Runoff Control Program. (2015). Hawaii's Nonpoint Source Management Plan (2015-2020). Retrieved from: http://health.hawaii.gov/cwb/files/2013/05/2015-Hawaii-NPS-Management-Plan.pdf.
[293] State of Hawaii, Office of Planning. (1996). Hawaii's Coastal Nonpoint Pollutant Control Program. Retrieved from: http://files.hawaii.gov/dbedt/op/czm/initiative/nonpoint/cnpcp_mgmt_plan.pdf.
[294] State of Hawaii Department of Health, Clean Water Branch, Polluted Runoff Control Program. (2015). Hawaii's Nonpoint Source Management Plan (2015-2020). Retrieved from: http://health.hawaii.gov/cwb/files/2013/05/2015-Hawaii-NPS-Management-Plan.pdf.

Impairment of Hawaii's Rivers and Streams in 2014

The U.S. Environmental Protection Agency (EPA) summarizes water quality data in helpful graphics. The EPA provides a summary of the *Hawaii Water Quality Monitoring and Assessment Report* in 2014.[295] Figures 42 and 43 show the amount of pollution in Hawaii's rivers in streams in 2014. Figure 42 reveals that of Hawaii's total 3,905 miles of all rivers and streams, the Department of Health assessed 2,567 miles, or 66% of the total rivers and streams in Hawaii. Figure 43 shows that of the 66% of the rivers and streams assessed by the Department of Health, 90% of the rivers and streams were determined to be impaired by pollutants. Figure 44 describes the causes and amount of impairment of the rivers and streams that were assessed.

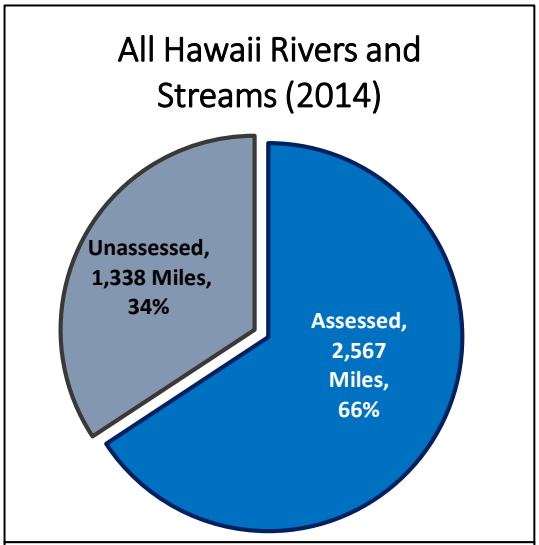


Figure 42. Water Quality Assessments for all of Hawaii's Rivers and Streams (2014).
Source: Environmental Protection Agency

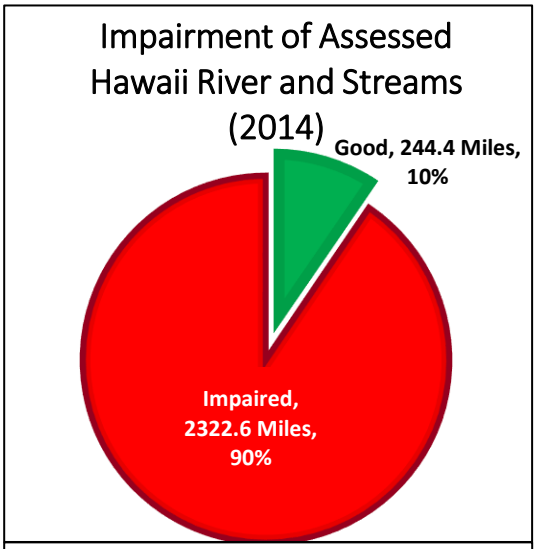


Figure 43. Water Quality Impairment of Hawaii's Assessed Rivers and Streams (2014).
Source: Environmental Protection Agency

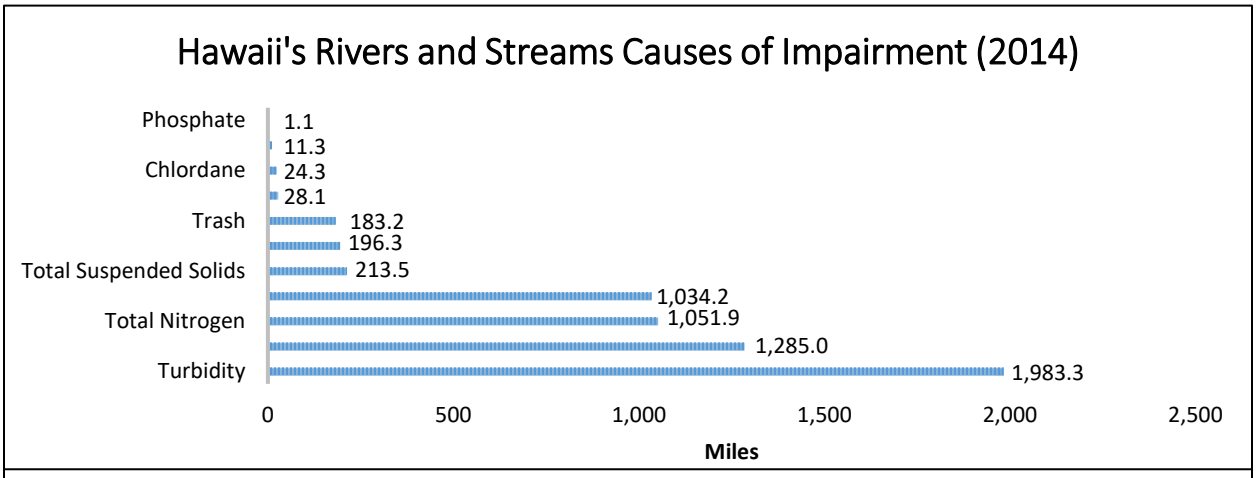


Figure 44. Hawaii's Rivers and Streams Causes of Impairment (2014).
Source: Environmental Protection Agency

[295] United States Environmental Protection Agency. (2014). Hawaii Water Quality Assessment Report. Retrieved from: https://iaspub.epa.gov/waters10/attains_index.control?p_area=HI#STREAM/CREEK/RIVER.

Impairment of Hawaii's Aquifers

There is no public data available measuring the water quality of Hawaii's aquifers. The EPA also notes that the total size of Hawaii's lakes, reservoirs, and ponds are unavailable. According to the *Hawaii Water Quality Monitoring and Assessment Report* in 2014, 4.9 acres of a lake, reservoir or pond was assessed and found impaired by turbidity, nitrogen, phosphorus, nitrate/nitrite, and trash.[296]

Impairment of Hawaii's Coastal Waters (Bays and Estuaries)

The U.S. Environmental Protection Agency (EPA) summarizes water quality data in graphics to understand the data. The EPA provides a summary of the *Hawaii Water Quality Monitoring and Assessment Report* in 2014.[297] Figures 45 and 46 show the amount of pollution in Hawaii's bays and estuaries in 2014. Figure 45 reveals that of Hawaii's total 94.1 square miles of all bays and estuaries, the Department of Health assessed 88 square miles, or 94% of the total bays and estuaries in Hawaii. Figure 46 shows that of the 94% of the bays and estuaries assessed by the Department of Health, 98% of the bays and estuaries were determined to be impaired by pollutants. Figure 47 describes the causes and amount of impairment of the bays and estuaries assessed.

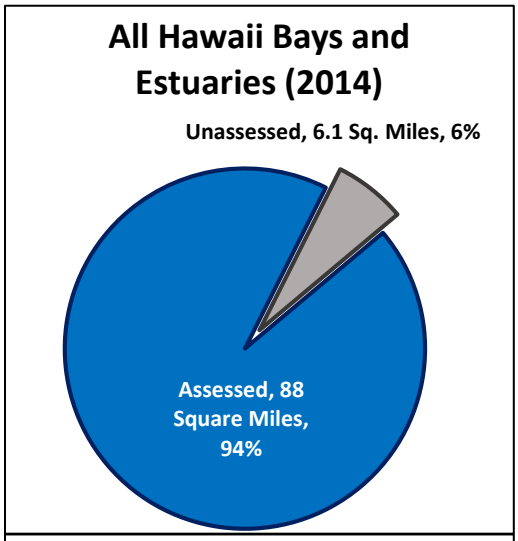


Figure 45.Water Quality Assessments for all of Hawaii's Bays and Estuaries (2014).
Source: Environmental Protection Agency

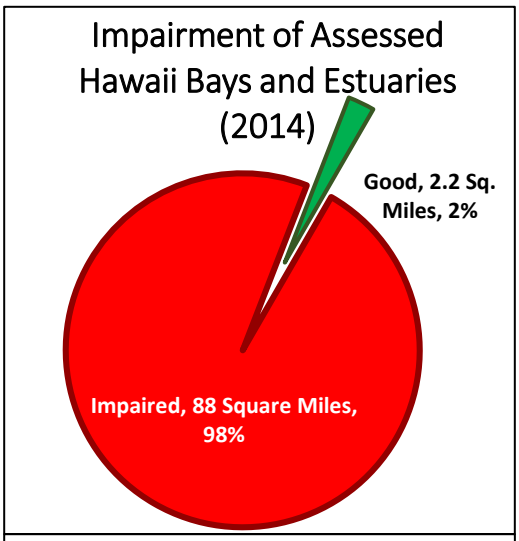


Figure 46. Water Quality Impairment of Hawaii's Assessed Rivers and Streams (2014).
Source: Environmental Protection Agency

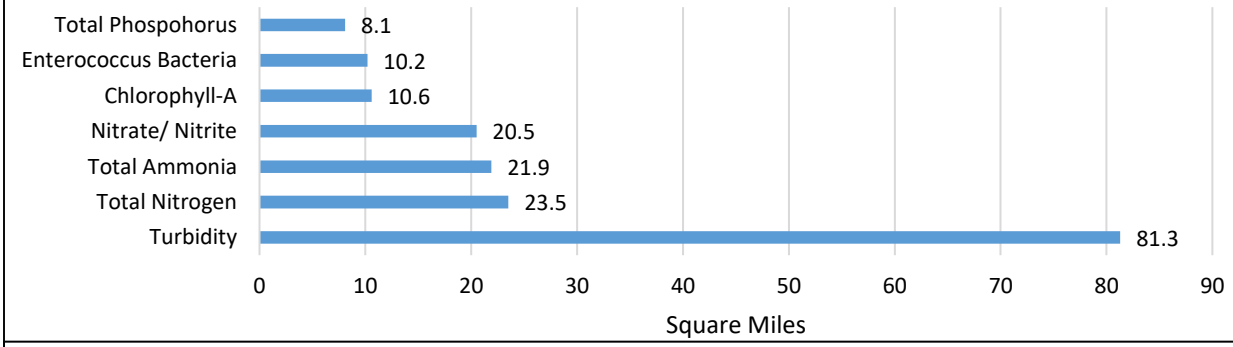


Figure 47 Hawaii's Bays and Estuaries Causes of Impairment (2014).
Source: Environmental Protection Agency

[296] United States Environmental Protection Agency. (2014). Hawaii Water Quality Assessment Report. Retrieved from: https://iaspub.epa.gov/waters10/attains_index.control?p_area=HI#STREAM/CREEK/RIVER.
[297] Ibid.

Impairment of Hawaii's Coastal Waters (Coastal Shorelines)

The U.S. Environmental Protection Agency (EPA) summarizes water quality data in graphics to understand the data. The EPA provides a summary of the *Hawaii Water Quality Monitoring and Assessment Report* in 2014.[298] Figures 48 and 49 show the amount of pollution in Hawaii's coastal shorelines in 2014. Figure 48 reveals that of Hawaii's total 1,052 miles of all coastal shorelines, the Department of Health assessed 170.3 miles, or 16% of the total coastal shorelines in Hawaii. Figure 49 shows that of the 16% of the coastal shorelines assessed by the Department of Health, 67% of Hawaii's coastal shorelines were determined to be impaired by pollutants. Figure 50 describes the causes and amount of impairment of the coastal shorelines assessed.

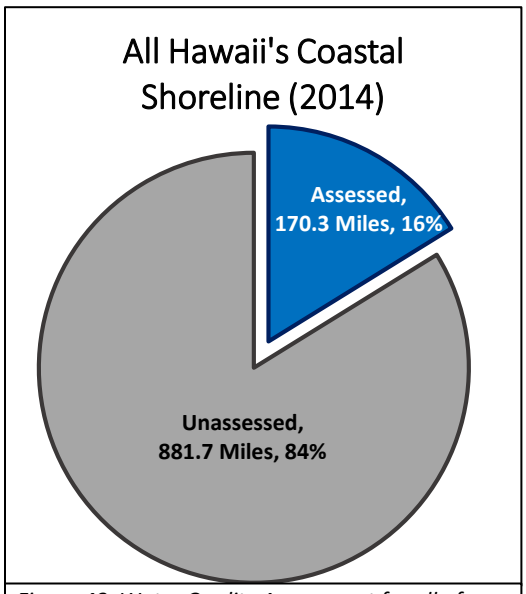


Figure 48. Water Quality Assessment for all of Hawaii's Coastal Shorelines (2014).
Source: Environmental Protection Agency

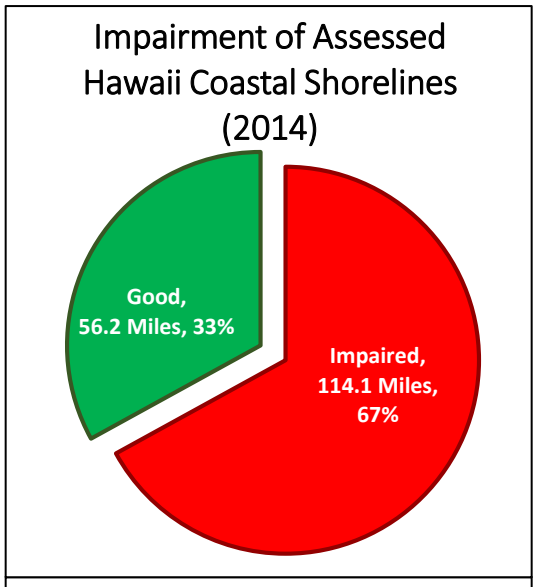


Figure 49. Water Quality Impairment of Hawaii's Assessed Coastal Shorelines (2014).
Source: Environmental Protection Agency

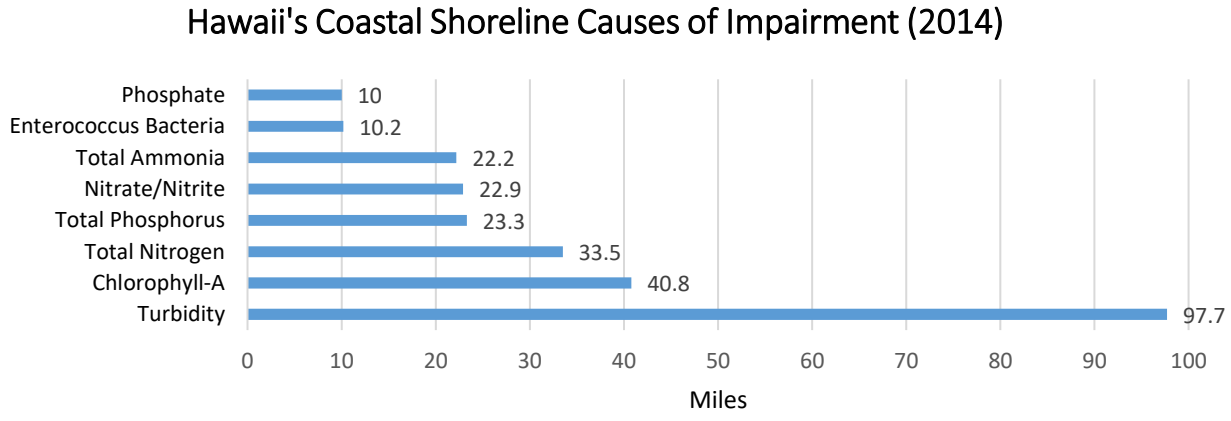


Figure 50. Hawaii's Bays and Estuaries Causes of Impairment (2014).
Source: Environmental Protection Agency

[298] United States Environmental Protection Agency. (2014). Hawaii Water Quality Assessment Report. Retrieved from: https://iaspub.epa.gov/waters10/attains_index.control?p_area=HI#STREAM/CREEK/RIVER.

In November 2017, the Department of Health's Clean Water Branch revamped its website providing up-to-date information on bacteria levels and brown water advisories along with aerial photos to provide the public with a more user-friendly alert notification system for Hawaii's beaches. The website will provide a quick overview of all active advisories, search functions by island and type of advisory, mapping to identify the areas of the advisories, polluted runoff control watershed based plans, and notifications for online subscribers.[299]

Water pollution laws were also recently enacted, including:

- **Act 42, (HB 1325), 2015**: Authorizes counties to establish and charge user fees for stormwater management. Similar stormwater utilities on the mainland serve an important tool for local governments to reduce runoff pollution, recharge local aquifers, and mitigate flood damage.[300] According to the *Blueprint for Action,* this policy will yield approximately 10 MGD by 2030.
- **Act 5 (HB 1509), 2017**: Requires the State and counties to consider storm water management in the development of the Hawaii Water Resource Protection Plan.[301]
- **Act 248 (HB 2030), 2016**: Prohibits the discharge of treated or raw sewage into state waters after 12/31/2026 except when used to create clean energy.[302]

The American Planning Association (APA) recently recognized that water resource issues should be accepted as highly interrelated with land development. Population and employment growth has increased demands on scarce water supplies. Pollution and water disposal practices have also diminished the quality and availability of water. Due to these challenges, the APA has recommended the concept of "One Water" management as a foundational paradigm for water sustainability planning.[303]

Water system problems can be characterized in one of three ways: not enough water, too much water, the quality of water is compromised. These three issues translate into challenges of scarcity of water supplies, flooding, and water pollution and contamination.[304] Aging and deteriorated infrastructure compounds these problems, which impact the environment, the economy, and society. Two factors—climate change and population change—are exacerbating existing water management challenges and creating new ones.[305] While measuring pollution through streams, it is important to highlight the need to address stormwater management. Stormwater is precipitation, such as rain, that is not absorbed into the ground but flows overland as runoff. In urbanized areas, where impermeable surfaces such as streets, sidewalks, parking lots, and buildings predominate, flooding can occur when large volumes of runoff flow into streams and rivers.[306]

[299] Hawaii Department of Health, Clean Water Branch System. (2017). Retrieved from: https://eha-cloud.doh.hawaii.gov/cwb/#!/home.
[300] Hawaii Community Foundation, Hawaii Freshwater Initiative. (2016). A Blueprint for Action: Water Security for an Uncertain Future (2016-2018). Retrieved from: https://www.hawaiicommunityfoundation.org/strengthening/fresh-water.
[301] Act 5, Session Laws of Hawaii (2017). Hawaii Revised Statutes §174C-31. Retrieved from: http://www.capitol.hawaii.gov/Archives/measure_indiv_Archives.aspx?billtype=HB&billnumber=1509&year=2017.
[302] Act 248, Session Laws of Hawaii. (2016). Hawaii Revised Statutes §342D-50.5. Retrieved from: http://www.capitol.hawaii.gov/Archives/measure_indiv_Archives.aspx?billtype=HB&billnumber=2030&year=2016.
[303] American Planning Association. (2017). PAS Report: Planners and Water. Retrieved from: https://www.planning.org/publications/report/9131532/.
[304] Sullivan, Katherine, Administrator, National Oceanic and Atmospheric Agency. (2016). Remarks, American Planning Association National Planning Conference, Phoenix.
[305] American Planning Association. (2017). PAS Report: Planners and Water. Retrieved from: https://www.planning.org/publications/report/9131532/.
[306] Konrad, C.P. 2003. "Effects of Urban Development on Floods." USGS Fact Sheet 076-03. Retrieved from: https://pubs.usgs.gov/fs/fs07603.

3.9 Number and Types of Invasive Species Introduced to Hawaii Annually, Including Intra-Island Migration:

In 2016, the *Hawaii Interagency Biosecurity Plan* (HIBP) was proposed as a coordinated effort between the Hawaii Department of Agriculture, the Department of Land and Natural Resources, the Department of Health, the University of Hawaii as well as other federal, state, county, and private agencies to increase biosecurity efforts across the state. The HIBP is designed to be implemented through 147 action items over a ten year period. The plan proposes new legislation, systems, and procedures to protect Hawaii's complex ecosystem.[307]

A recent audit, *BioInsecurity: Audit of the Hawaii Department of Agriculture's Plant Quarantine Branch* (Report 17-05) was published by the State Auditor in July 2017 and found that the Plant Quarantine Branch (PQB) lacked the data gathering and data analysis functions necessary to actively and continuously assess risks from invasive species. The audit further found that the branch's central database does not perform its core functions and was considered by HDOA-PQB staff to be unreliable and cumbersome to use. Finally, the audit found that the PQB lacked the organizational framework necessary to manage and communicate risks from invasive species.[308]

HAWAII'S TOP 10 INVASIVE SPECIES IN 2016

1. LITTLE FIRE ANT
2. COCONUT RHINOCEROS BEETLE
3. COQUI FROG
4. RAT
5. MONGOOSE
6. STRAWBERRY GUAVA
7. MICONIA
8. FIREWEED
9. INVASIVE ALGAE
10. ALBIZIA TREE

Department of Land and Natural Resources

In today's globally interconnected world, the State of Hawaii must be vigilant, responsive, and flexible in guarding against the threat of invasive species. Given the tremendous volume of cargo arriving through Hawaii's ports, PQB inspectors cannot examine every box of produce, every plant, or even every shipping container. Instead, the branch must develop processes and incorporate technology to deploy its inspectors and direct its biosecurity efforts efficiently and effectively.

To assist the Department of Agriculture in this effort, a recent biosecurity law was enacted as Act 163 (HB 1325; 2017), cited as "The Clift Tsuji Act" in honor of the late-State Representative Clift Tsuji, who was deeply devoted to fighting against invasive species through biosecurity statewide. Act 163 requires the Department of Agriculture to establish and report to the Legislature on parameters and construction requirements for biosecurity facilities that provide for and ensure the safety of agricultural and food commodities. This recent biosecurity law appropriated $3.6 million for several biosecurity initiatives within the Department of Agriculture.[309] The Clift Tsuji Biosecurity Act was signed into law in July 2017 and is awaiting implementation.

32,176,000 TONS OF DOMESTIC CARGO WAS IMPORTED INTO HAWAII IN 2015

2.5% OF CARGO WAS INSPECTED BY DEPARTMENT OF AGRICULTURE PLANT QUARANTINE BRANCH INSPECTORS

Hawaii Department of Agriculture, Hawaii State Auditor

[307] State of Hawaii, Hawaii Interagency Biosecurity Plan: 2017-2027. (2017). Retrieved from:https://dlnr.hawaii.gov/hisc/files/2017/02/Hawaii-Interagency-Biosecurity-Plan.pdf.
[308] State of Hawaii, Office of the Auditor. (2017). Audit of Hawaii Department of Agriculture's Plant Quarantine Branch (Report 17-05). Retrieved from: http://files.hawaii.gov/auditor/Reports/2017/17-05.pdf.
[309] The Clift Tsuji Act, Act 163. (2017). Hawaii Revised Statutes §150A-53. Retrieved from: http://www.capitol.hawaii.gov/session2017/bills/HB1325_CD1_.pdf.

3.10 Water Level in Streams and Aquifers:

Water use comes from two main sources—surface water and ground water. Understanding water use will help evaluate the effects of future development plans and trends, which in turn helps create more sustainable water use practices that can help meet future demand.[310]

In Hawaii, surface-water resources are especially vital for agricultural purposes, cultural practices, and Hawaii's native fauna. Measuring surface-water resources can serve as a useful indicator of the availability of Hawaii's groundwater as well. Streamflow is predominantly controlled by periods of heavy rainfall that cause direct runoff, while base flow is more of an indicator of groundwater recharge and storage. Streamflow during Hawaii's wet months (January – March) were low following El Niño periods and were high following La Niña periods during the 20th century.[311]

A 2013 study of *Trends and Shifts in Streamflow in Hawaii* researched the streamflow, base flow, peak flow, and rainfall records and compiled this data to reflect and document the overall hydrological changes in Hawaii over the previous century between 1913 and 2008.[312] The study found that over the last century, trend tests of Hawaii's streamflow and base flow reflected significant downward trends. There were no significant upward trends detected in any of Hawaii's streamflow or base flow records between 1913 and 2008 as depicted in Figure 51. Figures 52 and 53 reveal the general decline of Hawaii's base flow and streamflow, respectively, statewide since 1913.

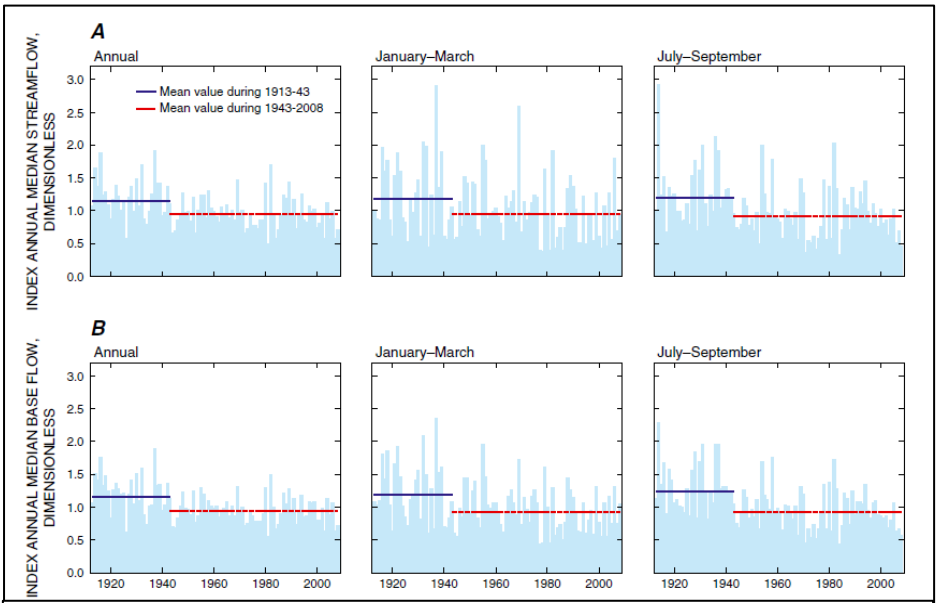


Figure 51. Values of annual, January-March (wet months), and July-September (dry months) index median flows during 1913-2008, Hawaii. (A) Streamflow and (B) Base flow. Courtesy: US Geological Survey

[310] American Planning Association. (2017). PAS Report: Planners and Water. Retrieved from: https://www.planning.org/publications/report/9131532/.
[311] Oki DS. (2004). Trends in streamflow characteristics at long-term gaging stations, Hawaii. Scientific Investigations Report 2004-5080, US Geological Survey.
[312] Bassionuini, M. and Oki DS. (2013). Trends and shifts in streamflow in Hawaii, 1913-2008. Hydrological Processes, 27, 1484-1500.

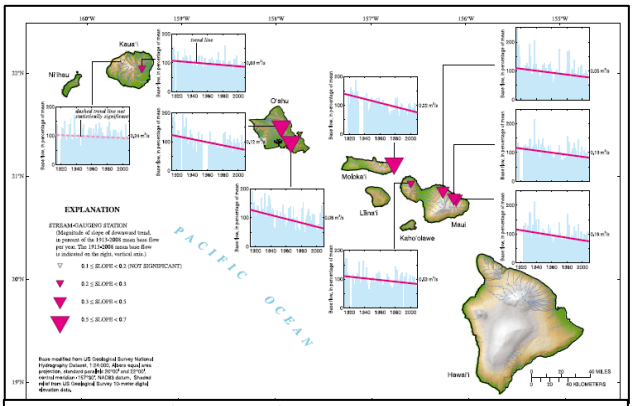


Figure 52. Trends in Base Flow in Hawaii, 1913-2008. Courtesy: U.S. Geological Survey

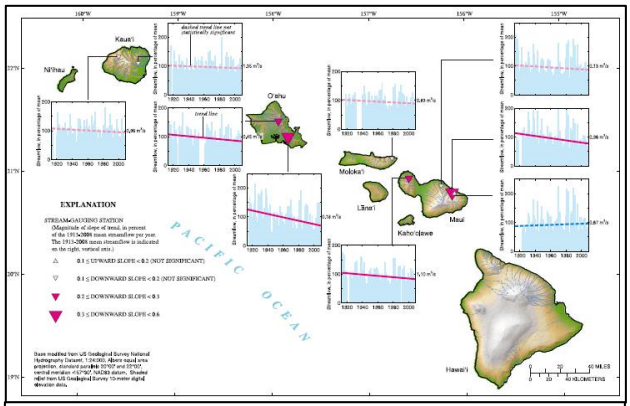


Figure 53. Trends in Streamflow in Hawaii, 1913-2008. Courtesy: U.S. Geological Survey

The study explained that the reduction of stream base flows reveal a reduction in groundwater recharge and storage, which is problematic for Hawaii since more than 90% of the drinking water used is derived from groundwater sources.[313] The reduction in groundwater recharge will have significant implications for future water planning and sustainability. Withdrawals from some of Hawaii's most productive aquifers were nearing their sustainable yields in 2013.[314] Scientists and researchers warn that as Hawaii's population increases, the demand for groundwater will also increase.[315] *Trends and Shifts in Streamflow in Hawaii* identified that as of 2013 "conflicts between those diverting water for irrigation purposes and those desiring greater instream flows have become common in recent years" (p.1498). The study also warned that it "may be necessary to identify other sources of water to meet future demands and develop strategies that help mitigate decreasing groundwater recharge, such as improved watershed forest management" (p.1498).

The long-term downward trends of Hawaii's streams identified between 1913 and 2008 were a result of long-term decrease in the water availability. The trends of Hawaii's streamflow and base flow were consistent with other climate change-associated trends, which indicate a drying climate for Hawaii as well as emphasize the vulnerability of Hawaii's streamflow to climate change.

Finally, the 2013 study explained that these descending trends in groundwater discharge into Hawaii's streams could play a significant role in Hawaii's future sustainability and have economic, social, and ecological implications for Hawaii's future groundwater and surface-water availability and management. The study's most imperative warning was that should these downward water availability trends continue, the future management of Hawaii's water resources will require adaptation to these climate change conditions.

Trends and Shifts in Streamflow in Hawaii, published in 2013, was the most recent study and assessment of Hawaii's streamflow trends. Although the USGS continues to collect streamflow data through web applications such as StreamStats, which define basin characteristics and estimate peak-streamflow statistics of Hawaii's streams, the USGS lacks the sufficient funds to update their streamflow trends assessment.[316] To successfully manage and develop strategies to improve Hawaii's water resources, additional studies on present and future changes in streamflow and base flow will be extremely relevant to understand Hawaii's future water sustainability.

[313] Bassionuini, M. and Oki DS. (2013). Trends and Shifts in Streamflow in Hawaii, 1913-2008. Hydrological Processes, 27, 1484-1500.
[314] Ibid.
[315] Ibid.
[316] Oki, D.S., Rosa, S.N., and Yeung C.W., (2010). Flood-frequency Estimates for Streams on Kauai, Oahu, Molokai, Maui, and Hawaii, State of Hawaii: U.S. Geological Survey Scientific Investigations Report 2010-5035. Retrieved from: http://pubs.usgs.gov/sir/2010/5035.

Hawaii Fresh Water Initiative

Hawaii's streamflow and base flow trends reveal a significant decrease in water levels. The Hawaii Fresh Water Council's *Blueprint for Action* recommends three goals to achieve by 2018 to ensure sustainable water management for Hawaii's future.[317]

One of the *Blueprint for Action's* three goals focuses on water recharge is to increase the amount of rainfall and surface stormwater. If fulfilled, this goal would yield 30 MGD in increased water availability by 2030.

- **Recharge**: Hawaii's underground freshwater supply can be restored with:
    1. Reduced pumping from aquifers,
    2. Increased rainfall, and/or
    3. Increased effective recharge

The *Blueprint for Action* explains that by increasing effective recharge rates is a critical factor in protecting Hawaii's aquifers. The Hawaii Fresh Water Council suggests initiative priorities to improve recharge capabilities, including improved funding for updated streamflow and base flow monitoring and reporting will increase the understanding of current and changing trends in Hawaii's water availability. Green infrasturcture recharge development projects could be implemented to capture and provide effective water recharge opportunities.

[317] Hawaii Community Foundation, Hawaii Fresh Water Initiative. (2015). A Blueprint for Action: Water Security for an Uncertain Future, 2016-2018. Retrieved from: https://www.hawaiicommunityfoundation.org/learning/a-blueprint-for-action-water-security-for-an-uncertain-future-2016-2018.

Goal 4: Sustainable Community and Social Well-Being

The Hawaii 2050 Sustainability Plan explained that quality of life depends on safe, caring, and engaged communities; healthy, sustainable surroundings; quality job opportunities for present and future generations; access to quality education, housing, and health care; adequate, well-maintained infrastructure and governmental services; access to recreational facilities and leisure activities; and positive interaction and respect among the citizenry.

The Hawaii 2050 Sustainability Plan highlighted that "the choices we make today are essential for tomorrow." (Hawaii 2050 Sustainability Plan, p.47) The quality of our lives in 2050 will depend on the choices we make today for a more prosperous future, including where jobs, productivity, wages, and education, achievements grow and economic disparities are reduced.

To measure this goal of establishing a sustainable community and social well-being, the Hawaii 2050 Sustainability Plan provided four strategic actions and the following seventeen indicators:

STRATEGIC ACTIONS:

1. **Strengthen social safety nets.**
2. **Improve public transportation infrastructure and alternatives.**
3. **Strengthen public education.**
4. **Provide access to diverse recreational facilities and opportunities.**

17 INDICATORS:

1. **Percentage of rental and for purchase housing stock that is affordable for persons earning up to 140% of median income.**
2. **Percentage of population owning residential dwelling units as their principal place of residence.**
3. **Percentage of population covered by health insurance.**
4. **Percentage of population using public transportation.**
5. **Percentage of population ridesharing.**
6. **Commute time for residents.**
7. **Percent change in annual vehicle miles travelled.**
8. **Percentage of total non-motorized trips.**
9. **High school graduation rates.**
10. **Proportion of high school students going on to post-secondary education.**
11. **Substance abuse rates.**
12. **Proportion of family income spent on housing.**
13. **Percentage of population engaged in volunteer work.**
14. **Percentage of population with internet access at their residence.**
15. **Out migration rates of high school graduates.**
16. **Percentage of children enrolled in pre-school.**
17. **Number and diversity of recreational facilities and activities per capita.**

Summary of Progress toward the "Sustainable Community and Social Well-Being" Strategic Actions and Indicators:

The Hawaii 2050 Sustainability Plan's fourth goal is to ensure that our community is strong, healthy, vibrant, and nurturing, providing safety nets for those in need, and has progressed over the past decade.

- **Affordability Problem**

Data based off this goal's indicators show that affording to live in Hawaii has grown to be more challenging over the past ten years. Data from indicators reveal that owner-occupancy in housing units have decreased over the past ten years. Most shocking is 2014 data reflecting that 71.8% of consumer spending in Honolulu revolve around housing, transportation, and food.

- **Pedestrian Walkability and Bicycle Access is Low**

Outdated data from four indicators reveal that pedestrian walkability and bicycle access throughout the State is low. Commuting continues to be heavily reliant on personal vehicles, public transportation, and ridesharing, and walking usage was low when last measured. There have been recent bike sharing and ride sharing initiatives that were not measured in recent statewide commuting studies. An updated commuting study should be performed to improve data collection measuring new sustainable transportation methods.

- **Outdated Indicators**

Data associated with some of this goal's indicators were not tracked or were outdated. Should the State fund an update to the Hawaii 2050 Sustainability Plan, this report recommends the update of social indicators to measure a sustainable society.

Measurement of Indicators:

4.1 Percentage of Rental and For Purchase Housing Stock that is Affordable for Persons Earning up to 140% of Median Income:

The Hawaii Housing Policy Studies of 2016 provide data of the occupied housing units which are occupied by resident households. Unfortunately, the data are not separated by percentage of rental housing and for-purchase housing reflected in Table 20.

Table 20. Statewide Households at HUD Income Guidelines (2006 – 2014)

	Total Households	30% AMI or less	Over 30% to 50% AMI	Over 50% to 80% AMI	Over 80% to 120% AMI	Over 120% and 140% AMI	Over 140% AMI
2006	435,818	14%	11%	20%	22%	8%	26%
2011	455,311	20%	17%	24%	12%	7%	22%
2014	462,876	16%	12%	21%	14%	13%	23%

Source: Hawaii Housing Planning Study, 2016 "Table A-3. Households at HUD Income Guidelines by County."

For the purposes of understanding this data, Table 21 is a compilation of the 2017 US Department of Housing and Urban Development's (HUD's) income limits, which provide income guidelines for the State of Hawaii's Hawaii Housing Financial Development Corporation (HHFDC) for a four-person household in each county in 2017 dollars.[318] For example, to better understand the data in Table 20, 21% of households statewide in 2014 yielded incomes over 50% to 80% of HUD's Area Median Income (AMI). Using the data in Table 21, a four-person household in Honolulu yielding between 50% and 80% AMI had incomes over $52,300 and under $83,680 (in 2017 dollars).

Table 21. HUD 2017 Income Limits for the State of Hawaii

	30% AMI	50% AMI	80% AMI	100% AMI	120% AMI	140% AMI
Honolulu County	$31,380	$52,300	$83,680	$104, 600	$125,520	$146,440
Maui County	$25,830	$43,050	$68,880	$86,100	$103,320	$120,540
Kauai County	$25,590	$42,650	$68,240	$85,300	$102,360	$119,420
Hawaii County	$22,230	$37,050	$59,280	$74,100	$88,920	$103,740

Source: Hawaii Housing Finance Development Corporation

[318] State of Hawaii, Hawaii Housing Finance and Development Corporation. (2017). 2017 Income, Sales, and Rent Guidelines. Retrieved from: http://dbedt.hawaii.gov/hhfdc/developers/copy2_of_copy_of_copy2_of_copy_of_income-sales-rent-guidelines/.

4.2 Percentage of Population Owning Residential Dwelling Units as their Principal Place of Residences:

The Hawaii Housing Planning Studies of 2006, 2011, and 2016 provide data of the owner-occupied housing units statewide, as reflected in Table 22.[319] Hawaii owner-occupancy declined 4.4% between 2006 and 2014.

48.9% OF HAWAII'S HOUSING UNITS WERE OWNER-OCCUPIED IN 2014

Hawaii Housing Planning Study

Table 22. Population of Owner Occupied Units (2006 – 2014)

	Total Housing Units	Total Owner-Occupied	Percent of Housing Units Occupied by Households
2006	501,956	267,923	53.3%
2011	516,394	261,516	50.6%
2014	524,852	257,121	48.9%

Source: Hawaii Housing Planning Study, 2011, 2016.

4.3 Percentage of Population Covered by Health Insurance:

According to the Department of Business Economic Development and Tourism (DBEDT), the percentage of civilian population with health insurance in Hawaii was 96% in 2015, 5.4% points higher than the U.S. average. Figure 54 ranked Hawaii 4th among the 50 states and the District of Columbia.[320]

96% OF HAWAII'S POPULATION WERE COVERED WITH HEALTH INSURANCE IN 2015

Department of Business Economic Development and Tourism

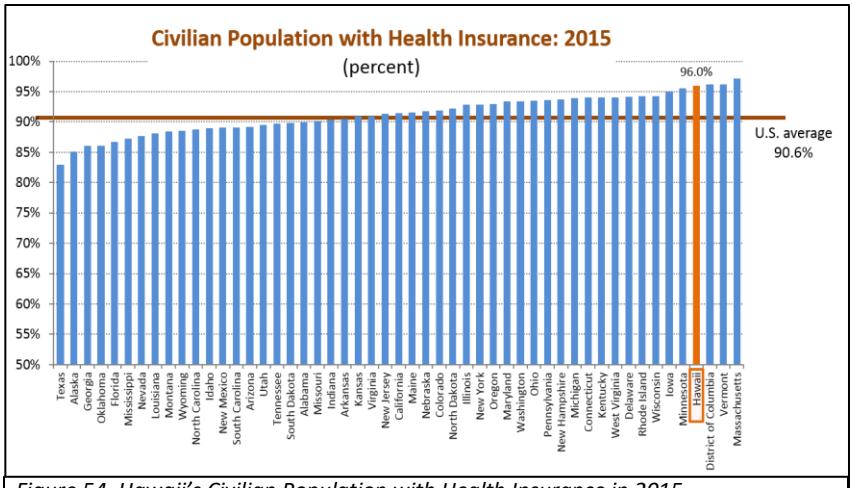


Figure 54. Hawaii's Civilian Population with Health Insurance in 2015.
Source: Department of Business Economic Development and Tourism

[319] State of Hawaii, Hawaii Housing Finance and Development Corporation, produced (2016). Hawaii Housing Planning Study, 2016. Prepared by SMS Research. Retrieved from: https://luc.hawaii.gov/wp-content/uploads/2017/05/Ex.-14_Hawaii-Housing-Planning-Study-2016.pdf.
[320] State of Hawaii, Department of Business and Economic Development. (2016). Hawaii Rankings and Comparisons. http://dbedt.hawaii.gov/economic/ranks/.

4.4 Percentage of Population Using Public Transportation:

4.5 Percentage of Population Ridesharing:

The U.S. Census Bureau provides commuting patterns analyzing how much of the State of Hawaii's population uses public transportation and/or carpools in its American Community Survey, 5-year estimate as reflect in Figure 55.

6.5% OF HAWAII'S POPULATION USED PUBLIC TRANSPORTATION

14.1% OF CARPOOLED IN 2015

U.S. Census Bureau

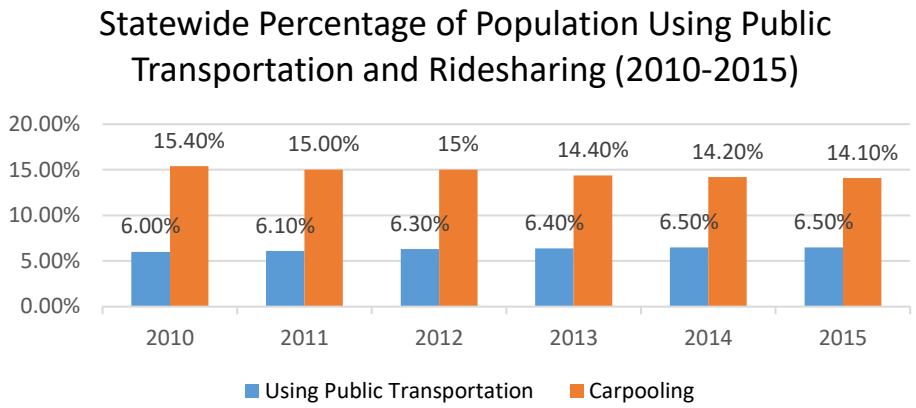
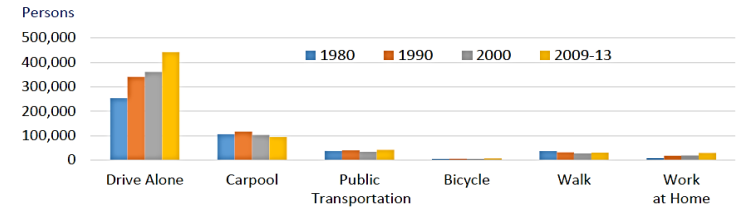
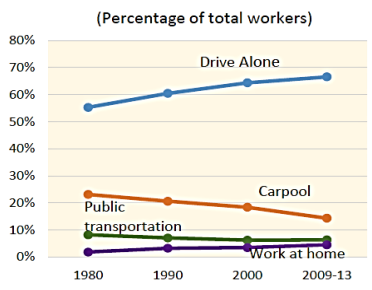


Figure 55. Statewide Percentage of Population using Public Transportation and Ridesharing (2010-2015).
Source: U.S. Census Bureau, American Community Survey 2010-2015 5-year Estimate.

The State of Hawaii's Department of Business and Economic Development (DBEDT) published its analysis of *Commuting Patterns in Hawaii* in 2015, which reflects the rate of change in public transportation use and carpooling between 1980 and 2013 as shown in Figure 56.





Mode	1980	2009-13	Changes
Drive alone	253,680	441,988	74.2%
Carpool	106,120	95,287	-10.2%
Public Trans.	37,840	42,251	11.7%
Walk	36,980	31,081	-16.0%
Bicycle	5,300	7,026	32.6%
Other means	10,280	15,893	54.6%
Work at home	8,480	30,192	256.0%

Figure 56. Statewide Commuting Patterns in Hawaii (1980-2013).
Source: Department of Business Economic Development and Tourism, "Commuting Patterns in Hawaii".

4.6 Commute Time for Residents:

The US Census provides the mean travel time to work between 2011 and 2015 as reflected in Table 23.

Table 23. Statewide Mean Commute Time, By County (2011 – 2015)

2011-2015	Honolulu County	Hawaii County	Kauai County	Maui County
Mean Commute Time (Minutes)	28.2 Minutes	25.1 Minutes	22.4 Minutes	21.3 minutes

Source: U.S. Census Bureau, American Community Survey 5-Year Estimate.

To study congestion levels and excess fuel consumed due to congestion delay, the Texas A&M Transportation Institute provides national Urban Mobility Information, which summarizes and determines nationwide congestion levels and trends in Figure 57.

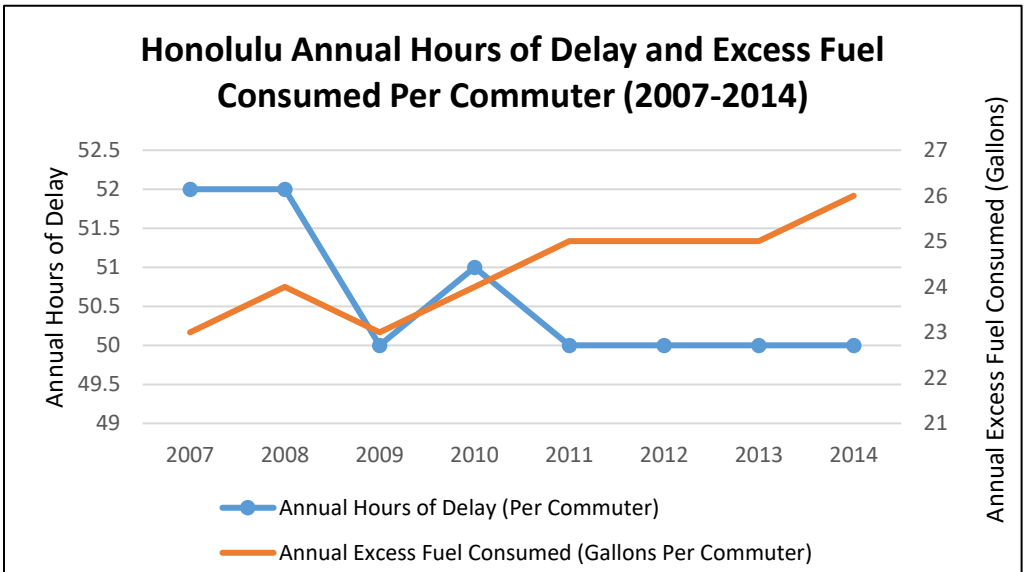


Figure 57. Honolulu Annual Hours of Delay and Excess Fuel Consumed by Commuter (2007-2014).
Source: Texas A&M Transportation Institute, Urban Mobility Information.

4.7 Percent Change in Annual Vehicle Miles Travelled:

The State of Hawaii's 2016 Data Book provides the statistical information of the annual vehicle miles travelled as depicted in Figure 58.

4.3% INCREASE IN ANNUAL VEHICLE MILES DRIVEN BETWEEN 2007 AND 2016

Hawaii State Data Book

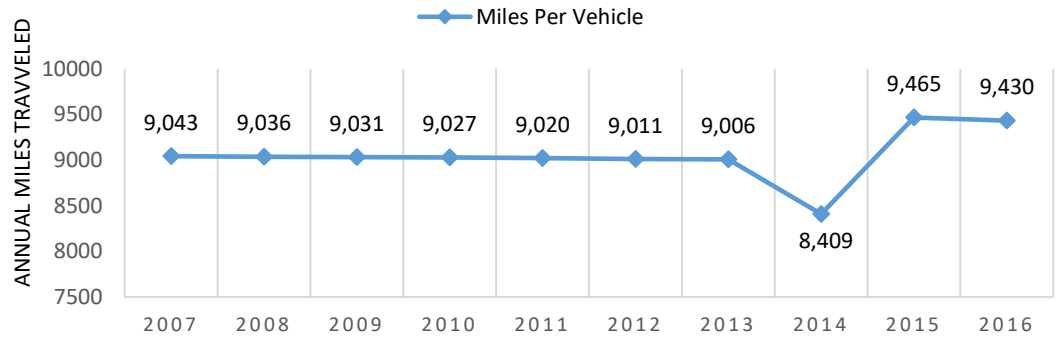


Figure 58. Statewide Annual Motor Vehicle Miles per Year (2007-2016).
NOTE: Data based on motor vehicle total by county inspection; includes both taxable and non-taxable vehicles, and all military non-resident exempt vehicles. Data include passenger cars, buses, trucks, and motorcycles but exclude trailers and semi-trailers.
Source: Hawaii State Data Book, 2016.

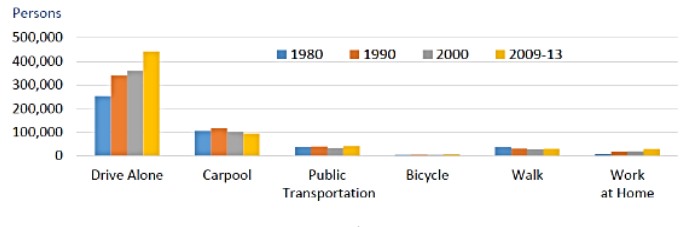
4.8 Percentage of Total Non-Motorized Trips:

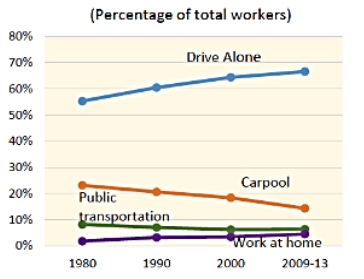
Unfortunately, there is no combined recent data measuring the total of non-motorized trips. The State of Hawaii's Department of Business and Economic Development and Tourism (DBEDT) published its analysis of *Commuting Patterns in Hawaii* in 2015, which references an earlier American Community Survey, 5-year estimates conducted by the US Census Bureau as depicted in Figure 59.

According to *Commuting Patterns in Hawaii*, non-motorized trends commuting to work by bicycle rose 32.6% from 5,300 bicycling commuters in 1980 to 7,026 bicycling commuters between 2009 and 2013. The same report revealed a decline of 16% in walking to work from 36,840 pedestrian commuters in 1980 to 31,081 pedestrian commuters between 2009 and 2013.[321]

Walk Score, a private company which provides walkability services and ratings through a website and mobile applications provides annual walkability indices that assigns a numerical walkability score between 0 and 100 that measures the walkability of any address in the United States. Walk Score rated urban Honolulu with a walk score of 64, transit score of 56, and bike score of 45 in 2016. These scores show that urban Honolulu is measured as only "somewhat walkable," offered "many nearby public transportation options," and has "minimal bike infrastructure." The majority of other towns and neighborhoods across the state were rated by Walk Score as "car-dependent cit[ies]".[322]

As of June 2017, Biki, Honolulu's new bikeshare program launched to make bicycles a more convenient and popular option for commuting within urban Honolulu. Since its launch in June 2017, Bikeshare Hawaii reported that Biki logged more than 360,729 total rides, with nearly two-thirds of its users (231,414) taken by Oahu residents in 2017.[323]





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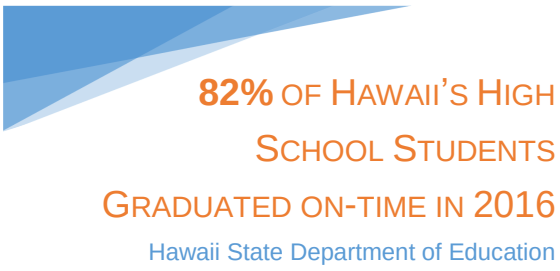
Public Trans.	37,840	42,251	11.7%
Walk	36,980	31,081	-16.0%
Bicycle	5,300	7,026	32.6%
Other means	10,280	15,893	54.6%
Work at home	8,480	30,192	256.0%

Figure 59. Commuting Patterns in Hawaii (1980-2013).
Source: Department of Business Economic Development and Tourism, "Commuting Patterns in Hawaii."

[321] State of Hawaii, Department of Business Economic Development and Tourism. (2015). Commuting Patterns in Hawaii. Retrieved from: http://files.hawaii.gov/dbedt/economic/data_reports/briefs/Commuting_Patterns_Apr2015.pdf.
[322] Walk Score. (2017). Retrieved from: https://www.walkscore.com/.
[323] Honolulu Star-Advertiser. (Nov 1 2017). Bikeshare Hawaii CEO Pleased by Growth, Says Biki Evolving. Retrieved from: http://www.staradvertiser.com/2017/11/01/hawaii-news/bikeshare-hawaii-ceo-pleased-by-growth-says-biki-is-evolving/.

4.9 High School Graduation Rates:

As the State's Department of Education (DOE) begins to focus on implementation of the Strategic Plan with an eye toward sustainable improvement in the public education system, focus has sharpened around three important areas: school design, student voice, and teacher collaboration. Work on these critical areas of strategic focus will continue in the coming years.



In addition to the Strategic Plan, the DOE has partnered over the past several years with Hawaii P-20 Partnerships for Education to track college and career readiness indicators.[324] An annual report has been produced every year since 2009. The report presents information on how well Hawaii's graduates are prepared to meet the DOE's vision of what a high school graduate should be. Indicators are based on recommendations from *Measures that Matter: Making College and Career Readiness the Mission of High Schools*, published by Achieve, a nonprofit education organization created in 1996 by a bipartisan group of governors and business leaders to help states with their college and career readiness goals.

Data presented in Table 24 is aggregate for the state; however, reports for individual high schools are available online.

[324] Hawaii P-20 Partnerships for Education. (2017). College and Career Readiness Indicators Reports. Retrieved from: http://www.p20hawaii.org/resources/college-and-career-readiness-indicators-reports/.

Table 24. DOE Statewide College and Career Readiness Indicators (2009-2016)

CLASS OF:	2009	2010	2011	2012	2013	2014	2015	2016
High School Completers[1]	11,451	10,787	10,805	11,596	11,275	11,216	10,927	11,003
On-time Graduation Rate[2]	80%	80%	81%	81%	82%	82%	82%	82%
Hawaii State Assessments (% Proficient)[3,4]								
Reading	60%	62%	65%	67%	67%	72%	72%	54%
Math	39%	43%	45%	49%	55%	60%	60%	30%
Science	27%	24%	N/A	27%	22%	22%	34%	30%
Advanced Placement (AP)[5]								
# (%) of completers taking AP exams	3,209 (28%)[6]	2,012 (19%)	2,298 (21%)	2,830 (24%)	3,022 (27%)	3,158 (28%)	3,268 (30%)	3,644 (33%)
# scoring ≥ 3 on at least one exam	2,068[7]	968	1,045	1,176	1,245	1,355	1,379	1,597
Dual Credit Participants[8]	478	562	607	671	723	879 (8%)	1,058 (10%)	1,573 (14%)
College Enrollment Nationwide, Fall[9]	50%	50%	53%	54%	54%	56%	56%	55%
2-year (% of completers)	27%	26%	27%	28%	26%	26%	25%	23%
4-year (% of completers)	23%	24%	26%	26%	28%	30%	31%	32%
College Enrollment, UH only, Fall # (%) of completers	4,590 (40%)	4,232 (39%)	4,384 (41%)	4,409 (38%)	4,258 (38%)	4,136 (37%)	3,956 (36%)	3,888 (35%)
Mathematics # (%) enrolled in UH								
College-level	809 (18%)	856 (20%)	883 (20%)	1,049 (24%)	1,138 (27%)	1,100 (27%)	1,058 (27%)	1,309 (34%)
Remedial or Developmental	1,725 (38%)	1,516 (36%)	1,562 (36%)	1,593 (36%)	1,342 (32%)	1,280 (31%)	1,101 (28%)	899 (23%)[10]
"Other"[11]	N/A	243 (6%)	249 (6%)	189 (4%)	209 (5%)	148 (4%)	130 (3%)	N/A
Not Enrolled	N/A	1,617 (38%)	1,641 (37%)	1,531 (35%)	1,516 (35%)	1,422 (34%)	1,469 (37%)	1,423 (37%)
English # (%) enrolled in UH								
College-level	1,603 (35%)	1,532 (36%)	1,686 (38%)	1,833 (42%)	1,728 (41%)	1,754 (42%)	1,670 (42%)	1,870 (48%)
Remedial or Developmental	1,583 (35%)	1,526 (36%)	1,507 (34%)	1,357 (31%)	1,311 (31%)	1,221 (30%)	976 (25%)	735 (19%)[10]
"Other"[11]	N/A	79 (2%)	70 (2%)	61 (1%)	52 (1%)	35 (1%)	39 (1%)	N/A
Not Enrolled	N/A	1,095 (26%)	968 (22%)	946 (21%)	979 (23%)	849 (21%)	937 (24%)	840 (22%)

[1] For these reports, high school completers include those who have earned diplomas or certificates of completion.
[2] On-time graduation rate is based on the first-time ninth grade cohort adjusted for students who transferred in or out.
[3] Hawaii State Assessment (HSA) proficiencies are based on each graduating class's 10th grade scores.
[4] 2016 percentages reflect performance on the Smarter Balanced Assessment, which replaced the HSA.
[5] Advanced Placement results are reported for high school completers who took at least one Advanced Placement exam during high school.
[6] For 2009, number and percentage of students taking AP exams.
[7] For 2009, number of exams scored 3 of 5 or better.
[8] Dual Credit participants are high school completers who took at least one credit course from the University of Hawaii while they were still enrolled in high school. Numbers reported for 2009 and 2010 reflect only participants in the Running Start program. These participants are high school completers who took at least one Running Start course during high school.
[9] These data represent high school completers' confirmed college enrollment following high school graduation and are based on reports provided by the National Student Clearinghouse.
[10] These figures represent enrollment in any course that is below college-level.
[11] "Other" courses satisfy UH general education mathematics or English requirements and/or may be used to fulfill a "terminal" mathematics or English requirement for a degree or certificate

Source: Hawaii Department of Education, data compiled from Hawaii P-20 Partnerships for Education Reports

4.10 Proportion of High School Students Going on to Post-Secondary Education:

The data reflected in Table 25 represent high school completers' confirmed college enrollment following high school graduation and are based on reports provided by the National Student Clearinghouse.

55% OF HAWAII'S HIGH SCHOOL CONTINUED ON TO POST-SECONDARY EDUCATION IN 2016

National Student Clearinghouse

Table 25. Hawaii High School Completers College Enrollment (2009 – 2016)

CLASS OF:	2009	2010	2011	2012	2013	2014	2015	2016
College Enrollment Nationwide, Fall	50%	50%	53%	54%	54%	56%	56%	55%
2-year (% of completers)	27%	26%	27%	28%	26%	26%	25%	23%
4-year (% of completers)	23%	24%	26%	26%	28%	30%	31%	32%
College Enrollment, UH only, Fall # (%) of completers	4,590 (40%)	4,232 (39%)	4,384 (41%)	4,409 (38%)	4,258 (38%)	4,136 (37%)	3,956 (36%)	3,888 (35%)

Source: Data compiled from reports provided by the National Student Clearinghouse.

4.11 Substance Abuse Rates:

The data reflecting the amount of substance abuse rates for Hawaii is provided by the Substance Abuse and Mental Health Services Administration (SAMHSA), an agency of the U.S. Department of Health and Human Services (DHHS). SAMHSA provides the percentages of selected drug use within Hawaii by age group through the National Survey on Drug Use and Health: Comparison of 2008-2009 and 2014-2015 Population Percentages, compiled in Table 26.[325]

Table 26. Hawaii Substance Abuse Rates Comparison between 2008 – 2009 and 2014 – 2015

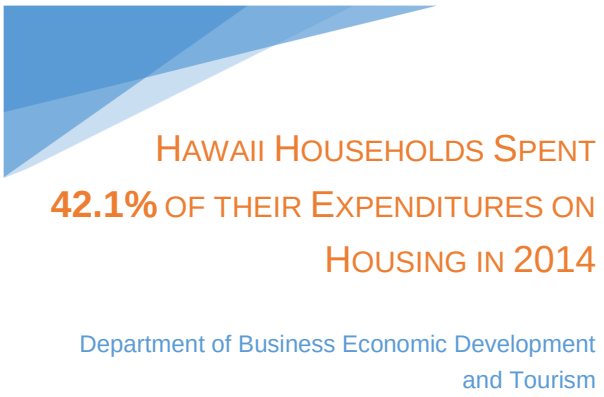
	Age 12+ (2008-2009)	Age 12+ (2014-2015)	Age 12-17 (2008-2009)	Age 12-17 (2014-2015)	Age 18-25 (2008-2009)	Age 18-25 (2014-2015)	Age 26+ (2008-2009)	Age 26+ (2014-2015)	Age 18+ (2008-2009)	Age 18+ (2014-2015)
Past Year Marijuana Use	12.06%	12.72%	14.45%	13.77%	31.14%	27.21%	8.74%	10.37%	11.82%	12.62%
Past Year Cocaine Use	1.76%	1.89%	1.25%	0.76%	4.39%	5.21%	1.40%	1.50%	1.81%	1.99%
Past Month Alcohol Use	48.23%	46.60%	11.64%	10.55%	57.21%	55.52%	50.95%	49.04%	51.81%	49.91%
Past Month Tobacco-product Use	22.31%	19.21%	9.93%	5.09%	13.26%	28.22%	21.32%	19.31%	23.51%	20.50%
Past Month Cigarette Use	20.24%	16.53%	7.60%	3.13%	34.07%	23.98%	19.46%	16.79%	21.47%	17.76%

Source: Data compiled from the National Survey on Drug Use and Health: Comparison of 2008-2009 and 2014-2015 Population Percentages.

[325] U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration. (2016). National Survey on Drug Use and Health: Comparison of 2008-2009 and 2014-2015 Population Percentages. Retrieved from: https://www.samhsa.gov/data/sites/default/files/NSDUHsaeLongTermCHG2015/NSDUHsaeLongTermCHG2015.htm.

4.12 Proportion of Family Income Spent on Housing:

Hawaii's Department of Business and Economic Development and Tourism (DBEDT) published many consumer spending reports studying each county's consumer spending habits. The *Summary of Consumer Spending by County: 2014* report was a statewide compilation of consumer spending habits throughout the State was released in February 2017. The results of DBEDT's study, depicted in Table 27, show that Hawaii households spent an average of 42.1% of their expenditures on housing.



It should be noted that each county's respective report included expenditures by demographic categories including age, income, and household size that are not included in the analysis below.[326]

Table 27. Percentage of Annual Household Expenditures by County in 2014

Category	Oahu	Maui	Hawaii	Kauai	State
Basic subsistence categories					
Housing	**44.1%**	**40.3%**	**40.5%**	**41.5%**	**42.1%**
Shelter	31.2%	25.1%	25.2%	26.7%	28.3%
Utilities, fuels, and public services	7.1%	8.4%	8.7%	8.1%	7.7%
Household operations	1.3%	1.9%	1.2%	1.2%	1.3%
Housekeeping supplies	1.3%	1.7%	1.7%	2.0%	1.5%
Household furn. & equipment	3.2%	3.2%	3.7%	3.5%	3.2%
Food	**13.2%**	**15.6%**	**14.4%**	**14.9%**	**14.1%**
Food at home	8.2%	11.0%	10.2%	9.9%	9.3%
Food away from home	5.0%	4.6%	4.1%	5.0%	4.8%
Transportation	**14.7%**	**15.7%**	**16.3%**	**16.8%**	**15.3%**
Vehicle purchases (net outlay)	4.2%	5.0%	4.2%	4.4%	4.2%
Gasoline and motor oil	2.6%	2.9%	3.6%	3.9%	3.1%
Other vehicle expenses	4.7%	4.5%	5.3%	4.7%	4.8%
Public and other transportation	3.1%	3.3%	3.2%	3.7%	3.2%
Health care	**5.7%**	**7.1%**	**7.6%**	**6.6%**	**6.5%**
Non-subsistence categories					
Personal ins and retirement savings	8.0%	7.4%	7.8%	6.8%	7.9%
Life and other personal insurance	1.1%	0.9%	1.0%	0.7%	1.0%
retirement savings and social security	6.9%	6.4%	6.9%	6.1%	6.9%
Apparel and services	1.9%	1.9%	1.7%	2.0%	1.9%
Entertainment	2.6%	2.7%	2.3%	2.2%	2.5%
Personal care products and services	1.0%	1.2%	1.4%	1.4%	1.1%
Reading	0.2%	0.2%	0.2%	0.2%	0.2%
Education	4.0%	2.6%	3.1%	1.5%	3.4%
Tobacco prod. & smoking supplies	0.2%	0.2%	0.2%	0.3%	0.2%
Miscellaneous	1.7%	1.9%	1.7%	1.9%	1.7%
Cash contributions	1.8%	1.8%	1.6%	2.6%	1.8%
Alcoholic beverages	1.0%	1.6%	1.4%	1.4%	1.3%

Source: Department of Business Economic Development and Tourism, Summary of Consumer Spending by County: 2014.

[326] State of Hawaii, Department of Business Economic Development and Tourism. (2017). Summary of Consumer Spending by County: 2014. Retrieved from: http://files.hawaii.gov/dbedt/economic/reports/CE_Comparison_Final.pdf.

4.13 Percentage of Population Engaged In Volunteer Work:

This report found that there was no state agency collecting or maintaining any data on the percentage of Hawaii's population engaged in volunteer work.

21.96% OF HAWAII'S POPULATION PARTICIPATE IN VOLUNTEER WORK IN 2015

Corporation for National and Community Service

The Corporation for National and Community Service (CNCS) is a federal agency that engages Americans across the country through its core programs: Senior Corps, AmeriCorps, the Social Innovation Fund, and Serve.gov. As the nation's largest grant maker for service and volunteering, CNCS plays a critical role in strengthening America's nonprofit sector and addressing our nation's challenges through service. Each year the CNCS ranks each state across the nation based on the percent of residents who volunteer, of the national rankings, Hawaii was among the ten lowest ranking states with the worst volunteer ranking.

According to the Corporation for National and Community Service, Hawaii has a total of 489 service sites, and 2,376 Senior Corps and AmeriCorps members. Hawaii has also collected a total of $18.4 million in CNCS and local funding, and received $16.6 million in AmeriCorps scholarships earned since 1994.[327] The following data in Figure 60 are a compilation of Hawaii's population percentage engaged in volunteer work according to the CNCS.[328]

Over the past decade, Hawaii has consistently ranked among the bottom ten states in volunteerism nationwide and volunteerism among Hawaii's population declined 2.74% between 2005 and 2015.

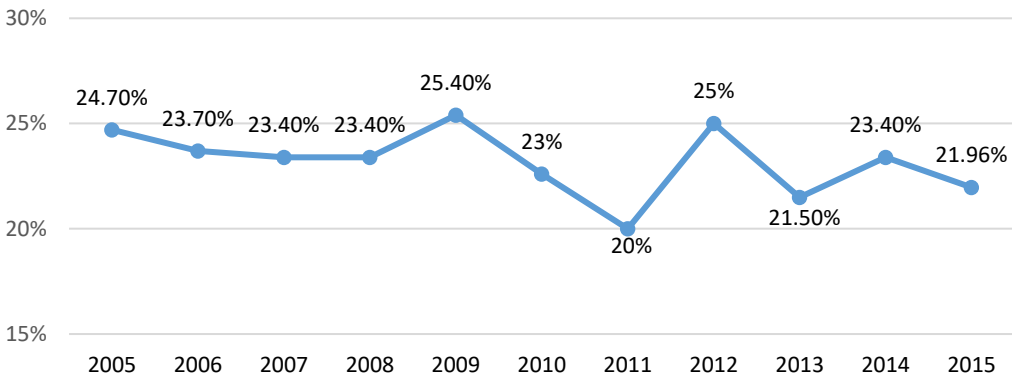


Figure 60. Hawaii Statewide Volunteer Rate (2005-2015).
Source: Corporation for National Community Service

[327] U. S. Corporation for National and Community Service. (2017). National Service in Hawaii. Retrieved from: https://www.nationalservice.gov/sites/default/files/upload/states/HI-StateGraphic.png.
[328] U. S. Corporation for National and Community Service. (2015). State Rankings by Volunteer Rate. Retrieved from: https://www.nationalservice.gov/vcla/state-rankings-volunteer-rate.

4.14 Percentage of Population With Internet Access At Their Residence:

The US Census American Community Survey began collecting and reporting the internet accessibility available in residential homes in 2013. Since 2013, Hawaii households consistently had a higher percentage of some form of internet access available in their homes compared to the US average. Figure 61 shows that in 2016, 84% of Hawaii's households had internet access at home.

84% OF HAWAII'S HOUSEHOLDS HAD INTERNET ACCESS IN 2016

US Census Bureau

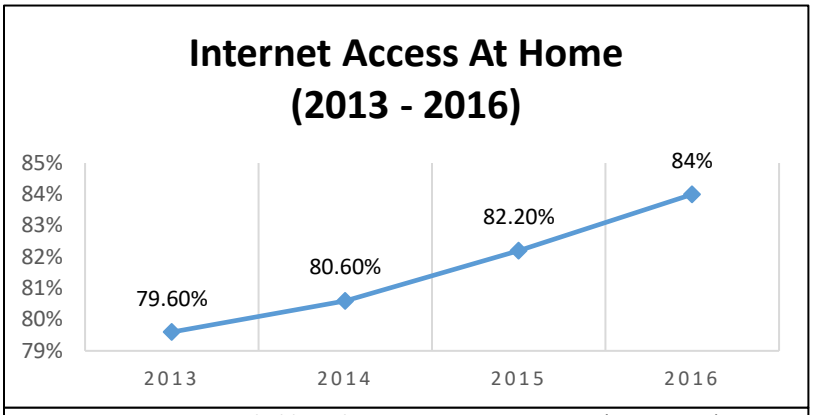


Figure 61. Hawaii Households with Internet Access at Home (2013-2016). Source: U.S. Census Bureau, data compiled from American Community Surveys.

4.15 Out Migration Rates of High School Graduates:

The US Department of Education's National Center for Education Statistics offers an annual Digest of Education Statistics, which provides biennial migration data of students leaving their home states.[329]

3,251 OF HAWAII'S HIGH SCHOOL GRADUATES LEFT HAWAII IN 2014

US Department of Education

The data show in Figure 62 that Hawaii's high school out-migration rates (Hawaii high school students who left Hawaii after graduation), increased 13% between 2008 and 2014.

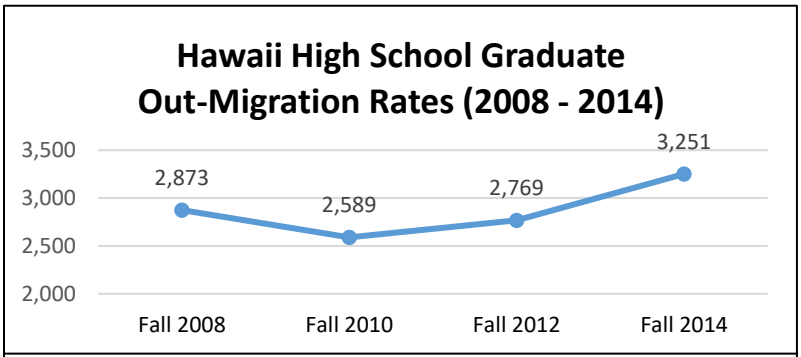


Figure 62. Hawaii High School Student Out-Migration Rates (2008-2014). Source: U.S. Department of Education National Center for Education Statistics, Digest of Education Statistics.

[329] U.S. Department of Education, National Center for Education Statistics. (2016). 2008-2016 Digest of Education Statistics. Retrieved from: https://nces.ed.gov/programs/digest/index.asp.

4.16 Percentage of Children Enrolled in Pre-School:

Early learning opportunities in the state are varied and involve both public and private providers. The vast majority of children attending early education programs do so through private providers, though public offerings funded by both the state and federal levels, have been slowly growing.

In 2012, the Hawaii State Legislature passed Act 178, Session Laws of Hawaii 2012, which established the Executive Office on Early Learning (EOEL). EOEL has been tasked with developing a statewide early learning system to coordinate resources and increase the number of young children enrolled in early education programs.

In recent years, EOEL has focused on developing a public pre-kindergarten program and coordinating with other early learning service providers to increase access to early learning opportunities. Note that the numbers Tables 28 and 29 represent enrollment in public pre-K options, whereas the majority of children attending pre-K in the state do so through private pre-K providers.

Table 28. Hawaii Executive Office on Early Learning Public Pre-Kindergarten Program (2014 – 2017)

YEAR	2014-2015	2015-2016	2016-2017
Total 4-yr. Old Population	17,451	18,461	Not available
Number of Classrooms	20	21	21
Available Seats	400	420	420
Total Enrollment	365	375	370
Teachers	20	21	21
Educational Assistants	20	21	21

NOTE: Upon initial establishment in 2012, EOEL was temporarily placed within the Governor's Office. However, since permanent agencies are not allowed to be attached to the Governor's Office, EOEL was administratively attached to the DOE beginning in 2015.
Source: Executive Office on Early Learning

Table 29. Children Attending Pre-Kindergarten Programs on DOE Campuses (2013 – 2017)

YEAR	2013-2014	2014-2015	2015-2016	2016-2017
SPED Pre-K (3 and 4 years)	1,527	1,462	1,537	1,532
KALO Pre-K (3 and 4 years)	113	101	88	90
EOEL Pre-K (4 years only)	N/A	365	375	370
Charter Pre-K (4 years only)	N/A	N/A	72	Not available

Source: Hawaii Executive Office on Early Learning.

There appears to be no single indicator tracking the percentage of children enrolled in pre-school, particularly when the data is viewed longitudinally. The KIDS COUNT Data Book and Data Center does provide simple, descriptive longitudinal data for the "share of children ages 3 to 4 not enrolled in school, including nursery school, preschool school or kindergarten, during the previous three-months."[330] Due to small sample size, these data are based on a pooled three-year average of 1-year American Community Survey responses to increase the accuracy of the estimates.[331]

Table 30. Number and Percentage of 3- and 4-year olds Not Enrolled in Pre-K (2009 – 2015)

YEAR SPAN:	2009-2011	2010-2012	2011-2013	2012-2014	2013-2015
Number	16,000	17,000	18,000	18,000	19,000
Percentage	44%	46%	49%	49%	52%

NOTE: data reflected in Table 30 indicate that as a percentage of the total, over time, fewer 3- and 4-year olds are enrolled in some type of early learning program. These numbers should not be taken at face value. Additional targeted research needs to be done to contextualize the data and determine the actual impact and its cause.
Source: Population Reference Bureau, analysis of data from the U.S. Census Bureau, pooled 2007-2009 to 2013-2015 one-year American Community Survey.

[330] The Annie C. Casey Foundation. Kids Count Data Center. (2017). Young Children Not in School. Retrieved from: http://datacenter.kidscount.org/data/tables/9010-young-children-not-in-school?loc=13&loct=2#detailed/2/13/false/1491,1443,1218,1049,995/any/17975,17976.
[331] Ibid.

4.17 Number and Diversity of Recreational Facilities and Activities Per Capita:

Due to the lack of a permanent government sustainability coordinating entity, the number and diversity of recreational facilities and activities per capita was not measured over the past ten years.

The Department of Land and Natural Resources, Division of Forestry and Wildlife (DLNR-DOFAW) provided information on the recreational facilities they provide, which include 900,000 acres of public hunting lands and 855 miles of trails and access roads. DLNR continues to improve and expand access and hunting opportunities.

Financial Literacy:

The Hawaii 2050 Sustainability Plan also discussed the importance of increasing awareness and competency in financial literacy and asset building to strengthen Hawaii's social safety net. There was no indicator provided to measure financial literacy implementation; therefore, this summary will be added to show recent developments to increase awareness and competency in financial literacy.

The Department of Education (DOE) explained their involvement in improving the financial literacy competencies through Hawaii's public schools. Senate Concurrent Resolution 97, Senate Draft 1 (SCR 97) was adopted by the Hawaii State Legislature in 2015.[332] SCR 97 requested the DOE establish a Hawaii Public Schools Financial Literacy Task Force (Task Force). In its final report to the Legislature, the task force provided the following findings[333]:

> "There is general consensus among all sectors of the community about the importance and need for financial literacy education for all students. Research conducted by the Financial Literacy Task Force and the results of a separate stakeholder Financial Capability Survey conducted in 2015 by the Hawaii Alliance for Community-Based Economic Development provided the basis for the following findings.
>
> - **Financial Literacy Models and Pathways.** There are financial literacy education models currently in place in Hawaii's public schools. Hawaii's core standards provide rigorous foundational knowledge and skills, and the Career and Technical Education (CTE) and Personal Transition Plan (PTP) courses are existing pathways that can be leveraged directly to engage Hawaii students in learning about financial literacy.
> - **Community Resources.** There is a plethora of community resources available to schools; however, there is a need for system-wide coordination of access to and use of such resources and programs. Some of the resources are unique to a community or island, others are available statewide. A coordinated effort will allow schools to match community resources to their student data, thereby ensuring relevant and culturally sensitive programs.
> - **Learning Opportunities, Transition Points.** The transition from middle school to high school and the transition out of high school are ideal avenues to reach all students in providing financial literacy education. Currently, all public school students entering high school must create Personal Transition Plans [sic] that identifies [sic] benchmarks at each grade level to prepare them for college or future careers.

[332] S.C.R. 97, S.D.1, 28th Leg., Reg. Sess. (Haw. 2015). Retrieved from: https://www.capitol.hawaii.gov/session2015/bills/SCR97_SD1_.pdf.
[333] State of Hawaii, Department of Education. (2015). Financial Literacy Task Force Final Report. Retrieved from: https://www.hawaiipublicschools.org/Reports/leg15_finlit.pdf.

- **Financial Literacy Learning Standards.** It is critical that the DOE, in partnership with financial literacy experts, integrate and align the financial literacy learning standards and resources with the Hawaii Common Core Standards.
- **Profession [sic] Development.** Professional development to provide teachers with the knowledge and skills to integrate financial literacy instruction into their classrooms is essential. This will require additional financial resources.
- **Implementation and Sustainability.** There is an overarching need for a systemic effort to coordinate, integrate, and sustain financial literacy education in the schools. This includes the engagement of community partners and acquisition of resources to sustain the initiative. Other issues that need further study include addressing legal and cultural concerns, identifying aligned curricula and programs, obtaining trained and qualified financial literacy teachers, and dedicating instructional time to teaching financial literacy."[334]

The Task Force also made the following policy recommendations:

"Near Term Goals

Recommendation 1. Community stakeholders and the Department of Education collaborate to establish a financial literacy resource page on the Department website that contains links to local and national financial literacy resources.

Recommendation 2. The DOE Office of Curriculum, Instruction, and Student Support shall identify and align the current content standards with financial literacy concepts.

Long Term Goals

Recommendation 3. The DOE Office of Curriculum, Instruction, and Student Support shall create and identify professional development opportunities for teachers to become trained to deliver financial literacy in the classroom.

Recommendation 4. The Department of Education shall consider the establishment of a position in the DOE's Office of Community Engagement in the Office of the Superintendent dedicated to identify [sic] schools interested in participating in financial literacy integration projects and provide links to exiting financial literacy providers.

Recommendation 5. The Department of Education shall encourage the Hawaii Congressional Delegation to identify and secure Federal funding to support financial literacy in Hawaii public schools."[335]

The DOE has already made progress toward implementing these policy recommendations. The DOE's public website has a page dedicated to financial literacy that identifies and links to various resources, including those provided by the Department of Commerce and Consumer Affairs, financial reality fairs, and additional resources, including the personal finance course Junior Achievement Hawaii and resources provided by local banks and credit unions.[336] The DOE also created a matrix identifying DOE standards with opportunities to integrate financial literacy concepts.[337]

[334] Financial Literacy Task Force Final Report, pp. 7-8.
[335] Ibid, p.24.
[336] State of Hawaii, Department of Education. (2017). Financial Literacy Website. Retrieved from:http://www.hawaiipublicschools.org/TeachingAndLearning/StudentLearning/FinLit/Pages/default.aspx.
[337] State of Hawaii, Department of Education. (2016). Hawaii Department of Education standards with Opportunities to Integrate Financial Literacy Concepts. Retrieved from:http://www.hawaiipublicschools.org/DOE%20Forms/Standards/HIDOEStandards_FinLit.pdf.

In addition, as the Financial Literacy Task Force acknowledges, there are several schools, particularly those in the Hawaii Academy Schools Consortium, that have already integrated financial literacy education into their Career and Technical Education pathways. Model examples include Kapaa High School and Waipahu High School.[338]

The Hawaii 2050 Sustainability Plan also encouraged the State to provide after-school and extra-curricular programs to enable Hawaii's youth to broaden their life experiences; therefore, §302A-1149 of the Hawaii Revised Statutes establishes the Department of Education's authority to enter into agreements and contracts with individuals, organizations, and agencies for the use of facilities for the operation of after-school child care programs. To this end, the DOE oversees and manages several different out-of-school time programs, including the following[339]:

A+

The DOE contracts with partners to provide after-school care for children of working parents. Each contractor operates programs at specified school sites, where students have the opportunity to work on homework and participate in enrichment activities including arts, crafts, drama, dance, sports, and games. Fees for this program are nominal to ensure that it is an affordable option for as many families as possible.

REACH

The Resources for Enrichment, Athletics, Culture, and Health program provides an organizational framework for after-school programs for students in grades 6-8. The stated purpose of the program is to provide academic and social foundations to serve as a buffer against high school dropout. The initiative uses federal and state funds to implement a community-based approach through partnerships with schools, parents, and the private sector to provide after-school programs that focus on academic enrichment, athletics, and arts and culture.

UPLINK

The Uniting Peer Learning, Integrating New Knowledge program is an after-school program for middle-school-aged children using funds from the Temporary Assistance for Needy Families (TANF) federal grant. This activity-based program is intended to proactively counter risky behavior during after-school hours and includes offerings such as cooking, gardening, music, dance, seasonal sports, crafts, and math classes; math and science clubs; and multimedia and computer activities, all with an emphasis on character-building and good decision-making. The program also offers homework assistance and tutoring.

Along with these programs, there continues to be an emphasis on providing out-of-school time programs. In 2016, the Hawaii State Legislature adopted House Concurrent Resolution 137 Senate Draft 1, *Requesting the Department of Education to Convene a Working Group to Review After-school Programs in Hawaii's Public Middle and Intermediate Schools*.[340] The working group, convened by the Director of the DOE's Community Engagement Office, met four times between June 30, 2016, and November 17, 2016 to assess the landscape of middle and intermediate after-school programs and provide recommendations for future action. The result was a final report that detailed common assumptions, collected data, and recommendations, including the continuation of the Working Group.[341]

[338] Financial Literacy Task Force Final Report, pp. 19-20.
[339] State of Hawaii, Department of Education. (2017). After School Programs Website. Retrieved from: http://www.hawaiipublicschools.org/BeyondTheClassroom/AfterSchoolPrograms/Pages/home.aspx.
[340] H.C.R. 137, S.D.1, 28th Leg., Reg. Sess. (Haw. 2016). Retrieved from: https://www.capitol.hawaii.gov/session2016/bills/HCR137_SD1_.PDF.
[341] State of Hawaii, Department of Education. (2016). After School Programs for Public Middle and Intermediate Schools Final Report. Retrieved from: http://www.hawaiipublicschools.org/Reports/LEG16_afterschool.pdf.

Goal 5: Sustaining Kanaka Maoli Culture and Island Values

The Hawaii 2050 Sustainability Plan highlighted that with no aloha, there is no sustainability. Among the Hawaii 2050 Task Force's statewide measurement of Hawaii's residents' sustainability goals, one of the strongest themes that emerged from the surveyed residents, whether they were born locally in Hawaii or not, was their attraction to and wish to remain in Hawaii because of our unique island values and lifestyle. Hawaii residents statewide expressed their respect and aloha for the traditions and values of our Kanaka Maoli and diverse island cultures that makes Hawaii unique.

To measure the goal to sustain our Kanaka Maoli culture and island values, the Hawaii 2050 Sustainability Plan provided four strategic actions and the following eight indicators:

STRATEGIC ACTIONS:

1. **Honor Kanaka Maoli.**
2. **Celebrate our cultural diversity and island way of life.**
3. **Enable Kanaka Maoli and others to pursue traditional Kanaka Maoli lifestyles and practices.**
4. **Provide support for subsistence based businesses and economies.**

EIGHT INDICATORS:

1. **Percentage of students enrolled in Kanaka Maoli language classes at the secondary and post-secondary levels.**
2. **Number of teachers teaching the language of the Kanaka Maoli.**
3. **Number of hula halau and ethnic dance groups.**
4. **Per capita government and private expenditures on culture and the arts.**
5. **Attitudinal survey of the perpetuation of Kanaka Maoli culture and island values (aka the "aloha index").**
6. **Number of laws enacted that protect Kanaka Maoli intellectual property and traditional knowledge, cultural expressions, art forms and site-specific areas including language dialects, place names, and resource practices.**
7. **Number of community programs and projects that promote Hawaiian culture, knowledge, traditions and practices through the means of the Hawaiian language.**
8. **Amount of capital provided to sustain subsistence-based businesses and economies.**

Summary of Progress toward the "Sustaining Kanaka Maoli Culture and Island Values" Strategic Actions and Indicators:

The Hawaii 2050 Sustainability Plan's fifth goal, to ensure that our Kanaka Maoli and island cultures and values are thriving and perpetuated, has slowly progressed over the past decade.

- **Outdated Indicators/Terminology**

The majority of this goal's indicators were not tracked, unmeasurable, or outdated. Should the State fund an update to the Hawaii 2050 Sustainability Plan, this report recommends the update of cultural indicators to measure a sustainable island culture. Members of the Native Hawaiian community should provide insight to better develop the cultural goals for Hawaii's sustainability.

Measurement of Indicators:

1.1 Percentage of Students Enrolled in Kanaka Maoli Language Classes at the Secondary and Post-Secondary Levels:

Department of Education

Over the past ten years, the DOE invested many of its resources to integrate and sustain Kanaka Maoli culture and values throughout the public school system. The Office of Hawaiian Education (OHE), established in 2014 and led by community leader and educator Kauʻi Sang, has made great strides in further developing the Hawaiian Language Immersion Program, supporting Hawaiian Language Immersion Charter Schools, and bringing together the Kanaka Maoli community to work toward common education goals.

In addition, the 2017-2020 Joint DOE-BOE Strategic Plan includes Na Hopena Aʻo values as an all-encompassing starting point for how the DOE intends to approach its work and the education of our keiki. Nā Hopena Aʻo (HĀ) is a Hawaii Department of Education system-wide framework and Board of Education Policy to develop the skills, behaviors and dispositions that are reminiscent of Hawaii's unique context and to honor the qualities and values of the indigenous language and culture of Hawaii.

OHE is still in its formative years and has prioritized relevant capacity-building and outreach foci; much of the data the DOE has collected is qualitative in nature with quantitative data likely to come in the future. In laying a foundation for cultural sustainability, OHE has developed a strategic plan with community input gathered at annual Native Hawaiian Education Summits, which led several major initiatives within the DOE: the creation of a Hawaiian Language assessment and assessments for language arts and math in the Hawaiian language, the development of a Hawaiian Language Immersion Program Strategic Plan, and the department-wide integration of Nā Hopena Aʻo.

Working with community partners, including the Curriculum Research and Development Group, Aha Kauleo, and the Office of Hawaiian Affairs, OHE has led the effort in the development of Hawaiian Language Immersion Assessments. Rather being translating of existing assessments, these assessments are fully developed in the Hawaiian language to assess academic achievement against the Hawaii Common Core State Standards for students in the Hawaiian Language Immersion program.

In addition, OHE has been instrumental in facilitating the implementation of Nā Hopena Aʻo throughout the DOE. Nā Hopena Aʻo is a department-wide framework to develop the skills, behaviors, and dispositions that are reminiscent of Hawaii's unique context. It is intended to honor the qualities and values of the indigenous language and culture of Hawaii. Former Board of Education member Cheryl Lupenui began developing the framework in 2013; it was approved in June of 2015. The Board of Education Policy, Policy E-3: Nā Hopena Aʻo reads as follows[342]:

> Nā Hopena Aʻo ("HĀ") is a framework of outcomes that reflects the Department of Education's core values and beliefs in action throughout the public educational system of Hawaii. The Department of Education works together as a system that includes everyone in the broader community to develop the competencies that strengthen a sense of belonging, responsibility, excellence, aloha, total well-being and Hawaii ("BREATH") in ourselves, students and others. With a foundation in Hawaiian values, language, culture and history, HĀ reflects the uniqueness of Hawaii and is meaningful in all places of learning. HĀ supports a holistic learning process with universal appeal and application to guide learners and leaders in the entire school community.

[342] State of Hawaii, Board of Education. (2016). BOE Policy E-3 Nā Hopena Aʻo (HĀ). Retrieved from: https://www.hawaiipublicschools.org/DOE%20Forms/HA-Article-July2016.pdf.

The following guiding principles should lead all efforts to use HĀ as a comprehensive outcomes framework:

- All six outcomes are interdependent and should not be used separately.
- Support systems and appropriate resources should be in place for successful and thoughtful implementation.
- Planning and preparation should be inclusive, collective and in a timeframe that is sensitive to the needs of schools and their communities.
- Current examples of HĀ in practice can be drawn on as sources for expertise.
- All members of the school community share in the leadership of HĀ.

(Hawaii Board of Education, Policy E-3)

OHE has hosted several different events as part of the Nā Hopena A'o implementation process, including a HĀ Designers Convening as a start to hosting HĀ Community Days and an Annual HĀ Summit, as well as several publications to assist school in integrating HĀ into their curriculum.[343]

Additionally, the development of programs and networks like Kanaeokana, which is a network of 'ōlelo Hawaii, Hawaiian culture, and 'āina-based schools (pre-school through university level) strengthen Hawaiian education help to ensure that schools with Hawaiian language programs continue to grow and thrive. Kanaeokana is primarily funded through the Kamehameha Schools, which highlights the important role private funders play in progressing this portion of the Hawaii 2050 Sustainability Plan. Additionally, the Hawaii Association of Independent Schools (HAIS) and local Western Catholic Education Association (WCEA) schools continue to add and increase their 'ōlelo Hawaii programming.

[343] State of Hawaii, Department of Education. (2017). Nā Hopena A'o (HĀ) Website. Retrieved from: http://www.hawaiipublicschools.org/TeachingAndLearning/StudentLearning/HawaiianEducation/Pages/HA.aspx.

University of Hawaii

The University of Hawaii's Kawaihuelani Center for Hawaiian Language provided their most recent enrollment data for the purposes of this report. The Kawaihuelani Center for Hawaiian Language's had a total student enrollment of 7,310 students between Fall 2013 and Spring 2017; however, the data show a steady decrease of student enrollment within the Kawaihuelani Center for Hawaiian Language.

Between these academic years, the University of Hawaii's Kawaihuelani Center for Hawaiian Language also provided the data of student enrollment of the HAW 101-Elementary Hawaiian course. The HAW-101 course is the entry-level course to the Kawaihuelani Center for Hawaiian Language and concurrently serves as a course fulfillment for the University's Hawaiian or Second Language Requirement. Contrary to the data of the Kawaihuelani Center for Hawaiian Language's total student enrollment shown in Figure 63, the HAW-101 Elementary Hawaiian course student enrollment shown in Figure 64 is more stable.

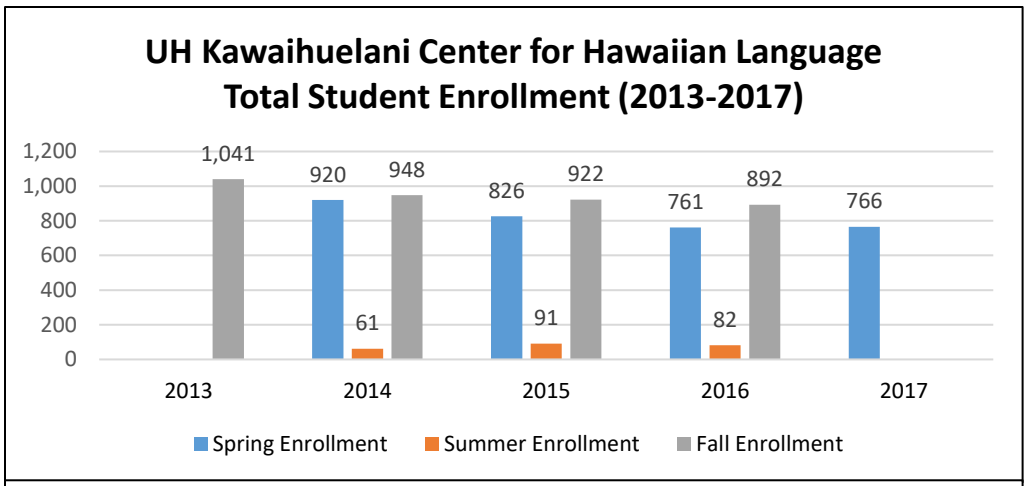


Figure 63. University of Hawaii Kawaihuelani Center for Hawaiian Language Total Student Enrollment. Source: University of Hawaii Kawaihuelani Center for Hawaiian Language.

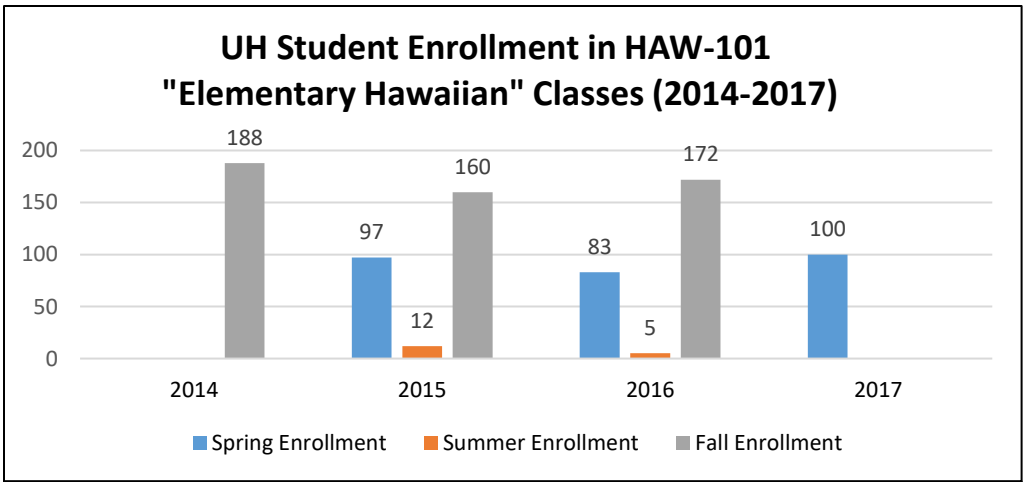


Figure 64. University of Hawaii Student Enrollment in HAW-101: Elementary Hawaiian (2014-2017). Source: University of Hawaii Kawaihuelani Center for Hawaiian Language.

1.2 Number of Teachers Teaching the Language of the Kanaka Maoli:

This report was unable to identify the exact number of teachers statewide teaching the Hawaiian language; however, this report will highlight the recent initiatives being made to revitalize Hawaiian language teaching and immersion.

Department of Education

The Department of Education and Hawaii's Public Charter Schools jointly participate in the Kaiapuni Schools, which provide Hawaiian language immersion. These Hawaiian language Immersion Schools are revitalizing the Hawaiian language through the education of students grades K-12. Kaiapuni Schools deliver instruction exclusively through the medium of the Hawaiian language until grade 5, whereupon English is formally introduced. Presently there are 23 Hawaiian language immersion schools: 17 HIDOE sites under the jurisdiction of the Superintendent and 6 Charter School sites under the jurisdiction of the Board of Education.[344]

DOE Schools:	Island of Hawaii:	Grades:
	'Ehunuikaimalino	K-12
	Hilo High	9-12
	Maui:	
	Hāna School	K-12
	Kalama Intermediate	6-8
	King Kekaulike High	9-12
	Lahaina Intermediate	6-8
	Lahainaluna High	9-12
	Nāhi'ena'ena Elementary	K-5
	Pā'ia Elementary	K-6
	Molokai:	
	Molokai Middle	7-8
	Molokai High	9-12
	Oahu:	
	Ānuenue	K-12
	Hau'ula Elementary	K-6
	Kahuku High & Intermediate	7-12
	Nānākuli Elementary	K-6
	Pūʻōhala Elementary	K-6
	Waiau Elementary	K-6

[344] State of Hawaii, Department of Education. (2017). Kaiapuni Schools-Hawaiian language immersion listing. Retrieved from: http://www.hawaiipublicschools.org/TeachingAndLearning/StudentLearning/HawaiianEducation/Pages/Hawaiian-language-immersion-schools.aspx.

Charter Schools:	**Island of Hawaii:**	**Grades:**
	Ka 'Umeke Kā'eo PCS	K-10
	Nāwahīokalani'ōpu'u Iki Lab PCS	K-8
	Molokai:	
	Kualapu'u El NCPCCS	K-6
	Oahu	
	Kamakau Lab PCS	K-12
	Kauai:	
	Ke Kula Niihau o Kekaha	K-12
	Kawaikini NCPCS	K-11

5.3 Number of Hula Halau and Ethnic Dance Groups:

There is no data available of the total number of hula halau and ethnic dance groups throughout the state over the past ten years.

Mele.com, a website that serves as an online source for Hawaiian music since 1995, provides a worldwide listing of halau hula as a resource service for students wishing to study Hawaiian hula as well as kumu hula. According to Mele.com, in 2017 there were a total of 203 halau hula statewide: 42 on the Island of Hawaii, 20 on the Island of Maui, 2 on the Island of Molokai, 20 on the Island of Kauai, and 116 on the Island of Oahu.[345]

[345] Mele.com. 2017. Worldwide Halau Hula (Hula Schools). http://www.mele.com/resources/hula.html.

5.4 Per Capita Government and Private Expenditures on Culture and the Arts:

Due to the lack of a permanent government sustainability coordinating entity, no measurement was conducted measuring the per capita government and private expenditures on culture and the arts over the past ten years. Government entities, however, including the Hawaii Tourism Authority and the Office of Hawaiian Affairs and private funders have provided grants and funding to support culture and the arts.

The Hawaii Tourism Authority (HTA) funds cultural events through its Kūkulu Ola Living Hawaiian Culture Program. These programs, initiated by the community and supported by HTA, showcase the unique and diverse experiences available for resident and visitor participation and attendance across the Hawaiian Islands. Since 2010, the HTA has awarded a total of $4,670,899.81 to 166 community organizations to host cultural events across the islands between 2010 and 2016, shown in Figure 66. In 2017, HTA funded 124 programs statewide through their community enrichment program, aloha aina program, and kukulu ola program.[346]

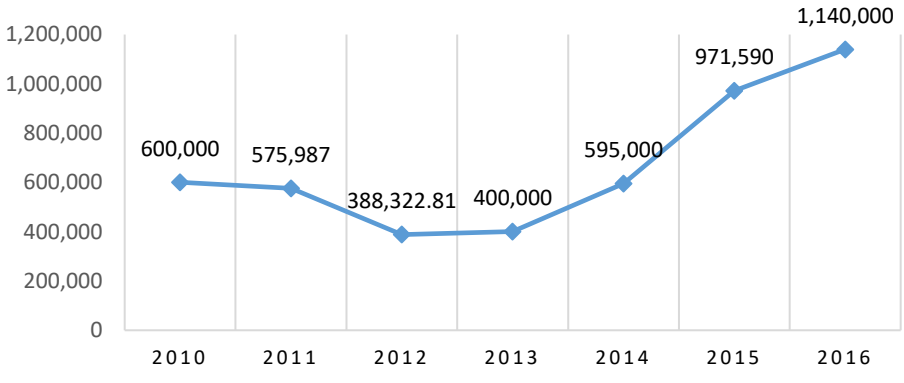


Figure 65. Hawaii Tourism Authority Kukulu Ola Living Hawaiian Culture Program Funding (2010-2016).
Source: Hawaii Tourism Authority

5.5 Attitudinal Survey of the Perpetuation of Kanaka Maoli Culture and Island Values (AKA The "Aloha Index"):

Due to the lack of a permanent government sustainability coordinating entity over the previous decade, no measurement of an attitudinal survey of the perpetuation of Kanaka Maoli culture and island values (aka the "Aloha Index") was conducted over the past ten years, elements of this should be integrated into the Hawaii Tourism Authority Resident Sentiment Study.[347]

[346] State of Hawaii, Hawaii Tourism Authority. (2017). 2018 Community Enrichment Program. Retrieved from: http://www.hawaiitourismauthority.org/default/assets/File/Community%20Programs%202018.pdf.
[347] State of Hawaii, Hawaii Tourism Authority. (2016). Annual Report to the Hawaii State Legislature. Retrieved from: http://www.hawaiitourismauthority.org/default/assets/File/2016HTAFinalAnnualReport%20Modified%20033017.pdf.

5.6 Number of Laws Enacted that Protect Kanaka Maoli Intellectual Property and Traditional Knowledge, Cultural Expressions, Art Forms and Site-Specific Areas including Language Dialects, Place Names, and Resource Practices:

Between 2008 and 2017, this report found that no state laws were enacted to protect the intellectual property of the Kanaka Maoli. An American University 2011 Intellectual Property Brief highlighted local history of Native Hawaiian needs for cultural trademarks and intellectual property rights to protect Native Hawaiian culture and recommended the establishment of a Native Hawaiian cultural trademark program as an important yet incremental step toward protecting native Hawaiian culture to build momentum of a larger dialogue in Hawaii of creating customized solutions to protect and preserve the indigenous intellectual property rights of Native Hawaiian culture.[348] Most recently, at the 2017 Association of Hawaiian Civic Clubs 58th Annual Convention, a resolution (2017-57) urging the Hawaii State Legislature to support indigenous intellectual property rights passed.[349]

5.7 Number of Community Programs and Projects that Promote Hawaiian Culture, Knowledge, Traditions and Practices through the Means of the Hawaiian Language:

Due to the lack of a permanent government sustainability coordinating entity over the previous decade, the number of community programs and projects that promote Hawaiian culture, knowledge, traditions, and practices through the means of the Hawaiian language was not measured over the past ten years; however, government entities, including the Hawaii Tourism Authority and the Office of Hawaiian Affairs, could possibly begin to coordinate and measure the number of these community programs through their grant funding to improve the availability of data in future measurements.

[348] Mantilla, N. (2011). American University Intellectual Property Brief, The New Hawaiian Model: The Native Hawaiian Cultural Trademark Movement and the Quest for Intellectual Property Rights to Protect and Preserve Native Hawaiian Culture. Retrieved from: http://digitalcommons.wcl.american.edu/cgi/viewcontent.cgi?article=1038&context=ipbrief.

[349] The Association of Hawaiian Civic Clubs. (2017). Resolution 2017-57: Urging the Hawaii State Legislature to Support the Intellectual Property Rights and Traditional Cultural Expressions in our Fashion Industry to Promote Productivity, Competitiveness, and Economic Growth. http://www.aohcc.org/images/stories/2017/Resolutions/2017-AHCC-Resolutions-Nos-41---58.pdf.

5.8 Amount of Capital Provided to Sustain Subsistence-Based Businesses and Economies:

The Office of Hawaiian Affairs' Strategic Plan was initiated in 2010 with goals to be achieved in 2018. The first data available toward these goals began in 2011-2012. The Office of Hawaiian Affairs (OHA) began reporting itemized information of the grants awarded to beneficiaries in 2012 through their annual reports, shown in Figure 66. Many of the programmatic grants for culture and land reflected traditional Hawaiian teachings of subsistence-based economies and businesses between 2012 and 2016.

Similarly, the Hawaii Tourism Authority offers Aloha 'Āina awards to community-based projects and programs that enhance, strengthen, and perpetuate the Hawaiian culture and community. Protecting Hawaii's natural resources was identified as necessary for achieving the vision of the Hawaii Tourism Authority's (HTA) Five Year Strategic Plan.[350] The Aloha 'Āina Program supports projects that ensure that the heart of Hawaii's resources are protected, respected, and perpetuated. This HTA program provides funding through requests for proposals to support organizations that manage, improve, and protect Hawaii's natural environment and areas frequented by visitors. The program awards funds up to $100,000 to organizations statewide. Figure 67 describes that between 2010 and 2016, HTA awarded $5,907,563.97 to 195 organizations statewide to protect Hawaii's natural resources through its Aloha 'Āina program statewide. As of 2017, HTA awarded 26 organizations through its Aloha 'Āina Program.[351]

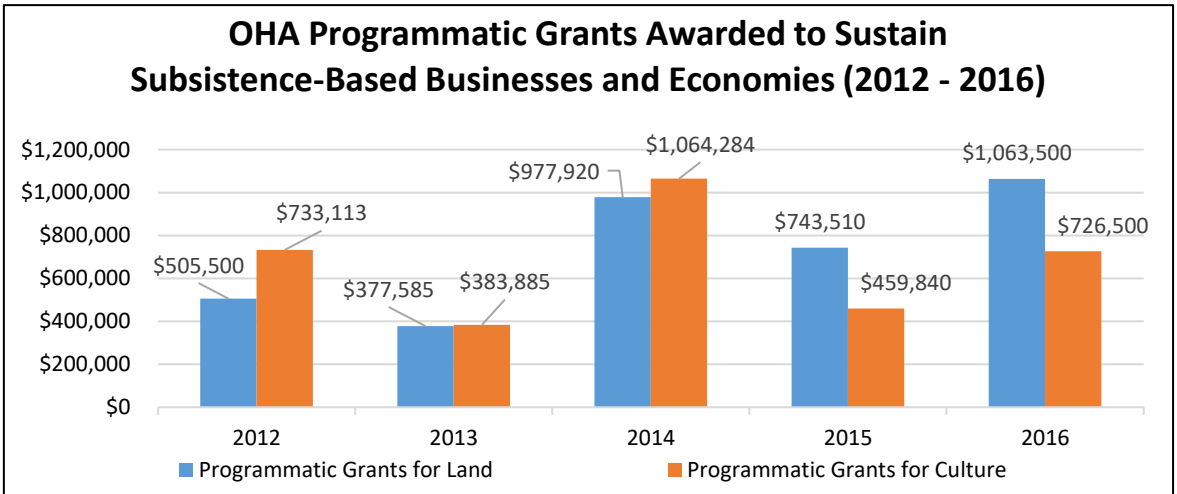


Figure 66. OHA Programmatic Grants Awarded to Sustain Subsistence-Based Businesses and Economies (2012-2016). Source: Office of Hawaiian Affairs Annual Reports 2012-2016.

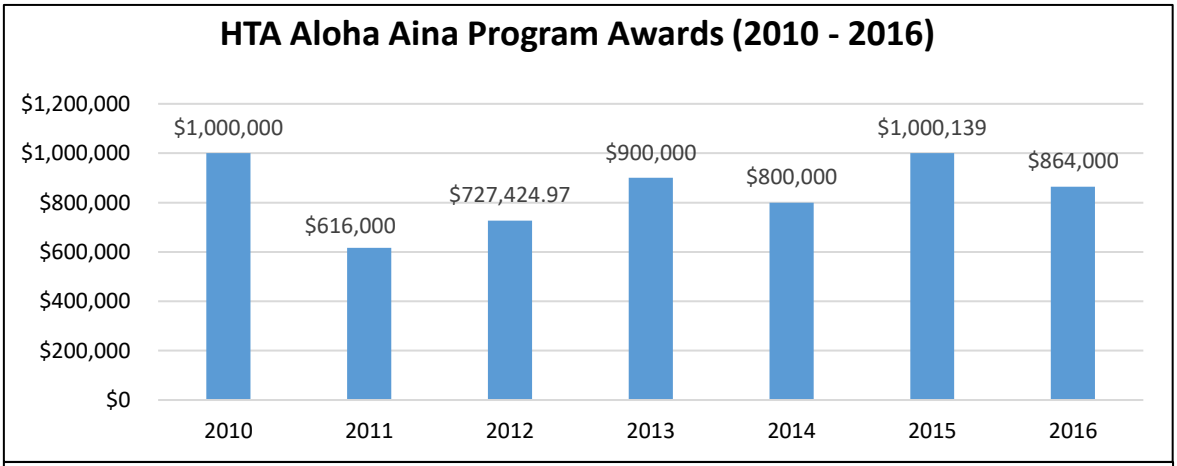


Figure 67. HTA Aloha Aina Program Awards (2010-2016). Source: Hawaii Tourism Authority

[350] State of Hawaii, Hawaii Tourism Authority. (2016). Five Year Strategic Action Plan. Retrieved from: http://www.hawaiitourismauthority.org/default/assets/File/HTA15001-Strategic%20Plan_web.pdf.
[351] State of Hawaii, Hawaii Tourism Authority. (2017). 2018 CEP Awardees. Retrieved from: http://www.hawaiitourismauthority.org/default/assets/File/Community%20Programs%202018.pdf.

Conclusion

The State of Hawaii published the Hawaii 2050 Sustainability Plan in 2008, ten years later Hawaii continues to work toward these same goals and issues. The State of Hawaii is fortunate to have an established sustainability plan, however, Hawaii must focus more on this plan's implementation, especially when this plan's priority actions to meet the "2020 benchmarks" are approaching.

Hawaii's sustainability ethic strengthened over the last decade, but this ethic was externally driven through climate change mitigation and adaptation reports and data, and recent international, national, and local sustainability efforts. Many of the sustainability efforts and indicators were not implemented by government in a coordinated manner.

Hawaii lacked a permanent governmental sustainability coordinating entity over the past ten years to assist with the implementation of the Hawaii 2050 Sustainability Plan and its sustainability goals. To improve the implementation and update of this plan, a stronger legislative framework about sustainability, the permanent establishment of a governmental sustainability coordinating entity with recognized responsibilities and authorities, and budgetary funding are necessary.

The Hawaii 2050 Sustainability Plan is outdated with some unmeasurable indicators. Funding will be necessary to perform a ten year update of this large plan pursuant to Act 8, Special Session Laws of 2005, with current scientific data, best management practices, and modern indicators to measure the sustainability of Hawaii, its economy, society, and natural resources. Future sustainability coordination should include but are not limited to: assessments of Hawaii's infrastructure, water security planning and strategies, sustainable land use recommendations, and local food security planning and strategies. These areas must be examined to prepare for a sustainable Hawaii by 2050.

Recommended Actions

1. Develop a Governmental Sustainability Entity

If creating a sustainability ethic within Hawaii's government is indeed a priority, then the permanent establishment of a government sustainability coordinating entity is necessary to help implement sustainable practices within government.

A Hawaii State Sustainability Office or Program should be created with additional staffing and a budget. The Hawaii State Sustainability Coordinator (or similar position) will need to be provided certain responsibilities and authorities to execute and ensure sustainability planning and implementation statewide. The following legislation, staffing, and funding is recommended:

- **Stronger Sustainability Legislative Framework**

  A sustainability framework that both defines and establishes more in-depth goals to achieve sustainability within state operations beyond Hawaii's Sustainability Priority Guidelines for the Hawaii State Plan will strengthen the implementation of sustainable practices for the State of Hawaii.

- **Statewide Sustainability Coordination**
  Additional staffing is necessary to ensure successful sustainability coordination and implementation statewide.

- **Interagency Sustainability Planning and Coordination**

  An interagency sustainability network can to serve as an informal forum of state agency personnel to exchange information and develop new approaches on sustainability among state agencies. This network could meet every two months to ensure that state agencies collaborate on sustainability programs and projects, and develop agency sustainability plans.

- **Dedicated Funding**

  Although the State of Hawaii presently has a state Sustainability Coordinator to assist the State in achieving its sustainability goals, no budget was provided to the Sustainability Coordinator for implementation purposes.

2. Update the Hawaii 2050 Sustainability Plan

Act 8, Special Session Laws of 2005 requires that the State Auditor with the assistance of the Office of Planning to update Hawaii 2050 Sustainability Plan every ten years. Since the Hawaii 2050 Sustainability Plan was published in 2008, the next update should take place in 2018. As noted in this report, many of the indicators are not current and need modernization.

Furthermore, the Hawaii 2050 Sustainability Plan should emphasize the need to focus more on Hawaii's water sustainability, as well as the sustainability of Hawaii's existing infrastructure as the State faces future climate change. Improved metrics and updated best practices should be incorporated into an updated Hawaii 2050 Sustainability Plan. Many new and updated best practices to improve various aspects of sustainability were published over the past decade that can assist with the update of the Hawaii 2050 Sustainability Plan, especially those from the American Planning Association, the Institute for Local Government, the US Green Building Council, and many other distinguished organizations. Funding, however, is necessary to perform an effective and comprehensive update to the Hawaii 2050 Sustainability Plan for the next ten years.

3. Update the Hawaii State Functional Plans

The State of Hawaii's Sustainability Plan should not replace the Hawaii State Plan. Since the Hawaii State Plan has incorporated sustainability as one of its priority guidelines and principles through §226-108 of the Hawaii Revised Statutes, sustainability, ideally, should now be practiced through the Hawaii State Plan as a guiding principle.

The 2008 publication of the Hawaii 2050 Sustainability Plan highlighted the 2050 Plan's intent to serve as a replacement to the Hawaii State Plan, due to the Hawaii State Plan being outdated. The Hawaii State Plan serves as the guiding plan and policy to direct and officiate the State of Hawaii; its functional plans need to be updated to tackle more modern issues and challenges of the 21st century.

The Hawaii 2050 Sustainability Plan should serve as the guiding plan and framework to direct and achieve the State of Hawaii's sustainability goals; smaller department-level sustainability plans could be created for improved interagency sustainability coordination.

4. Provide Regular Reporting

Although Act 8, Special Session Laws of 2005 requires an update of the Hawaii 2050 Sustainability Plan every ten years, and the Hawaii 2050 Sustainability Plan called for the Sustainability Council to issue a report card measuring progress. Many government entities perform regular annual reports to assess their progress. The appropriate permanent government sustainability coordinating entity could begin annual reports on Hawaii's sustainability performance to better assist decision-makers with a consistently updated baseline and concept of Hawaii's progress toward sustainability.

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