

UNIVERSITY OF HAWAI‘I SYSTEM REPORT



REPORT TO THE 2016 LEGISLATURE

Report by Hawai'i EPSCoR on Hawai'i State
Science and Technology Plan

Act 137, Session Laws of Hawai'i 2009

December 2015

A Report to the State of Hawai'i Legislature

On the Implementation of Act 137 of the 25th Legislature

As required in Section 4 of Act 137, Hawai'i EPSCoR is submitting a report on the status of the State of Hawai'i's Science and Technology Plan (Plan). The original Plan was submitted to Governor Linda Lingle and the leadership of both houses of the legislature on January 27, 2010.

Background

In 2008, the state was working on multiple fronts to promote and incentivize the science and technology sectors of the Hawai'i economy. Adjustments were being made to the Act 221 high technology tax credit, the Hawai'i Science & Technology Council (HSTC) was building a network of technology companies in the state and the University of Hawai'i was preparing a 5-year, \$20M proposal to the National Science Foundation's Experimental Program to Stimulate Competitive Research (EPSCoR) program's Research Infrastructure and Improvement (RII) solicitation.

The EPSCoR program's importance lies in its direct connection to the strong research capacity of the University of Hawai'i as a driving force for supporting a growing science and technology (S&T) industry through pursuit of basic knowledge, technology transfer, commercialization of discoveries, and education of an S&T workforce. This increased R&D capability was expected to provide key research infrastructure and further stimulate Hawai'i's economic development, including a diverse, well-prepared, STEM-enabled workforce. Moreover, EPSCoR designation by the National Science Foundation (NSF) allows Hawai'i researchers to participate in EPSCoR-like programs in other federal agencies including the National Institutes of Health (NIH) Institutional Development Award (IDeA) program and the U.S. Department of Energy and NASA EPSCoR programs.

Table 1:

Hawai'i's S&T Industry Economic Impact Highlights (2007)

- S&T sectors contributed about \$3 billion to the state's economy
 - Roughly 5 percent of the state's \$61 billion economy
- Hawai'i's S&T companies and government entities generated ~ 31,106 jobs
 - 3.6 percent of the state's employment
- Hawai'i's private technology sector employment grew 3.3 % annually between 2002 and 2007
- Hawai'i outpaced the U.S. annual employment growth rate of 1.8 percent for the private-sector technology industries
- Workers in technology sectors accounted for 3.6 percent of total employment in 2007, but they generated 5.4 percent of Hawai'i's total worker earnings 3 (\$2.1 billion).
- Workers in Hawai'i's private technology sector earned an annual average of \$63,623—38 percent more than the average worker in Hawai'i.

Following the completion of its landmark 2008 report *Innovation and Technology in Hawai'i: An Economic and Workforce Profile*, the HSTC and its network of members and stakeholders began working with the legislature to formally support S&T industries as economic drivers of the state. HB610 was introduced into the 25th Legislature with the intent of incorporating references to science and technology throughout HRS Section 226-6, **Objectives and policies for the economy-in general**, based on the economic impact of the existing technology sectors on the state economy (Table 1).

In addition to formally recognizing S&T as important sectors of our economy, the addition of Hawai'i S&T industries in HRS Chapter 226 also fulfilled a requirement by NSF that the research proposed for their Research Infrastructure and Improvement Track-1 (RII) competition align with state S&T priorities. To document this alignment, NSF requires each submitted proposal package to include evidence of a state S&T plan and endorsement of the proposal by the state's EPSCoR Steering Committee.

The subsequent HB601 Relating to Science and Technology was passed by the 25th Legislature despite overwhelming testimony in opposition to the bill by stakeholder groups including Department of Business, Economic Development & Tourism (DBEDT), Hawai'i EPSCoR, the High Technology Development Corporation (HTDC), the University of Hawai'i System, the Hawai'i Science & Technology Council, the Hawai'i Venture Capital Association and several private S&T companies. The final bill required Hawai'i EPSCoR, with the assistance of HTDC to develop a Hawai'i State S&T Plan. Governor Linda Lingle signed it into law as Act 137 on June 19, 2009.

Chronology: 2009-2015

The initial deliverable of Act 137 was to provide a plan to the legislature no later than 20 days prior to the 2011 regular session that included:

1. An evaluation of the effectiveness of past and current science and high technology legislation, including legislation relating to industry development, incentives, oversight, and sustainability;
2. A plan for the direction of Hawai'i's science and high technology sector, including:
 - a. A list of goals established for the science and high technology sector in the state;
 - b. A plan to reach the established goals; and
 - c. A timeline for implementation and completion
3. Criteria to measure the growth of emerging growth industries in the science and high technology sector;
4. Guidelines for future science and high technology legislation to assist the legislature in maintaining an overall framework to guide the development of science and high technology in the state; and
5. Recommendations or proposals for science and high technology legislation to meet the goals established in the plan.

The state’s technology community was largely organized under the leadership of the Hawai’i Science & Technology Council and included board representation of both Hawai’i EPSCoR and HTDC. A decision was made to leverage the Council’s knowledge assets to support the production an S&T Plan as called for in Act 137. A meeting of stakeholders in the early summer of 2009 produced a timeline for the development of the S&T Plan (Table 2).

One caveat however, was that the timeline did not meet the needs of Hawai’i EPSCoR. An external NSF Monitoring and Assessment Panel review of the new Hawai’i EPSCoR Project in March 2009 concluded “it would take an active intervention for Hawai’i EPSCoR to be in substantial compliance with the expectations of the NSF for the project to be consistent with the State’s S&T plan.” With a \$20M proposal under review at that time, EPSCoR was required to produce an interim S&T Plan, endorsed at the state level, to comply with NSF requirements and ensure that the proposal was eligible for funding. The Statewide EPSCoR Governing

Committee, composed of leaders in academia, government, local communities and private industry, initiated a process to develop an EPSCoR S&T Plan that would meet both the expectations of the NSF and further the mandates of Act 137. A Science & Technology Plan Subcommittee was formed to draft a framework of the Hawai’i State S&T Plan for NSF compliance as well as provide a foundation for the full S&T Plan that would be due in January 2011. The co-chairs of the Science & Technology Plan Subcommittee included Dr. Michael P. Crosby, interim vice chancellor for Research and Economic Development at the University of Hawai’i Hilo, Kevin Kelly, the University of Hawai’i System managing director of EPSCoR, and Elizabeth Corbin, manager, Science & Technology Branch, DBEDT. Committee members included a broad range of S&T stakeholders as shown in Table 3.

Parallel to the development of the framework plan, the HSTC had assembled a broad coalition of technology companies and stakeholders representing the majority of technology sectors in the state and was already conducting a series of assessments across each technology sector to provide critical insight into specific needs of companies in a range of categories including research, capital, workforce, infrastructure, and business climate.

Table 2:

2009 S&T Plan Timeline	
Summer 2009	<ul style="list-style-type: none"> • Production of Draft Framework Document • Interviews, Data Collection & Analysis
Fall 2009	<ul style="list-style-type: none"> • Final Framework Document • Approval by EPSCoR Statewide Committee • Informational Session for Legislators
January 2010	<ul style="list-style-type: none"> • EPSCoR S&T Plan Submitted to Governor & Legislature
Summer 2010	<ul style="list-style-type: none"> • Draft of Final S&T Plan Ready for Review • Public Review Sessions
Fall 2010	<ul style="list-style-type: none"> • Final Editing
January 2011	<ul style="list-style-type: none"> • Submission to Legislature

On January 27, 2010 the framework plan, “Hawai’i State Science & Technology Strategic Plan Framework,” was delivered to Governor Linda Lingle, Senate President Colleen Hanabusa, and House Speaker Calvin Say. Sections of the framework document provide a vision for Hawai’i S&T in 2020, and a framework of statewide S&T strategic priorities, near-term goals, and enabling strategies that would help guide the State’s utilization of resources to achieve a vision of a vibrant S&T enterprise -- including a diverse, well-prepared, STEM-enabled workforce. The Plan also included a summary of outreach efforts that were conducted with companies and organizations across the state.

Table 3:

2009 Science & Technology Subcommittee

Members

- Lisa Gibson, President, Hawai’i Science & Technology Council
- Neil Hannahs, Director, Land Assets Division, Kamehameha Schools
- Dr. Karl Hess, Hawai’i Innovation Council
- Jacqui Hoover, Executive Director, Hawai’i Island Economic Development Board
- Mary Lou Kobayashi, Planning Program Administrator, Office of State Planning
- Yuka Nagashima, Executive Director & CEO, High Technology Development Corporation
- Robert Shore, Chief, Economic Information Staff, DBEDT
- John Strom, Vice President for Business Development, Enterprise Honolulu
- Leslie Wilkins, Vice President, Maui Economic Development Board
- Mattie Yoshioka, President & CEO, Kauai Economic Development Board

Research Staff

- Terrilani Chong, EPSCoR Communications Officer
- Keith Mattson, UH Office of the Vice President for Research

In the 2010 legislative session S&T stakeholder groups focused on implementation of recommendations made to the legislature by the newly formed technology caucus working group. This group, brought together by the chairs of the senate committee on economic development and technology and the house committee on economic revitalization, business, and military affairs, included industry stakeholders and interested policymakers to develop recommendations for legislation to enhance Hawai’i's struggling economy. The working group provided a forum to review the current status of Hawai’i's S&T industry, identify state or county actions that impede long-term growth and expansion of technology companies, and develop recommendations to address

these impediments. The work group also identified best practices supporting the growth and development of science and technology industries in other jurisdictions to aid in developing proposed suggestions for future legislation. Of primary concern was the sunset of Act 221.

In 2010, while work on the full S&T plan continued, the team became increasingly concerned about how a statewide S&T Plan would be received by a new administration. Governor Neil Abercrombie’s release of his campaign roadmap, “A

New Day in Hawai'i"¹ included significant concepts around research, education and workforce development that raised caution within the S&T Plan group. After the election in November, it was clear that a significant revision of the plan was required to address the vision of the new administration. Hawai'i's technology leadership landscape was also changing dramatically. Dr. Michael P. Crosby, interim vice chancellor for Research and Economic Development, left the University of Hawai'i at Hilo to become director at the Mote Marine Laboratory & Aquarium in Sarasota, FL, Elizabeth Corbin, manager of the Science & Technology Branch at DBEDT retired and Lisa Gibson, the executive director of HSTC was replaced by Dr. Keiki Pua Dancil.

Senate Bill 2293 of the 25th Legislature served as the placeholder bill for new S&T legislation that could include such incentives and initiatives, however legislative efforts were primarily focused on:

- Evaluating the tax credit for research activities; and
- Developing legislation to improve the credit or establish alternatives

The bill passed out of the Senate Economic Development and Tourism Committee, but was not heard by the Ways & Means Committee and the measure died.

Also in 2010, new University of Hawai'i President M.R.C. Greenwood formally named a University of Hawai'i Innovation Council and charged its members with recommending how UH could best catalyze its own transformation and become a true leader in building regional economic leadership. The Innovation Council members included UH faculty leaders, venture capitalists, a former administrator of NASA, a dean at the University of California at San Diego, and the director of Stanford University's technology licensing office. HSTC Executive Director Keiki Pua Dancil was named the group facilitator.

The Hawai'i Innovation Initiative (HI²) was officially launched at a two-day symposium at the Sheraton Waikiki on January 12-13, 2011. In her conference presentation, President Greenwood noted that UH was seeking to become a major driver of innovation and commercialization in the state by initiating an institution-wide effort to enhance awareness of the potential applications of research and encourage entrepreneurship in its curriculum design, course content, and faculty incentives. President Greenwood listed three objectives in defining UH's mission. The first objective was to increase the number of educated citizens through the Hawai'i Graduation Initiative. The second was to "create a 21st-century capability for innovation and technology transfer" supported by "a billion-dollar research industry for Hawai'i." The final objective was to renovate and rebuild the university's infrastructure and to stimulate the creation of small businesses based

¹ A New Day in Hawai'i: A Comprehensive Plan to Invest in Education and Rebuild our Economy; to Sustain our Hawai'i for Future Generations; to Restore Public Confidence (2010) Neil Abercrombie for Governor campaign roadmap

on University of Hawai'i technology developments.² To support these objectives the Innovation Council proposed a bold set of recommendations, advocating that UH should:

- Identify research as an *industry* in Hawai'i;
- Identify areas for commercialization opportunities; and
- Integrate entrepreneurship into the curriculum.

The Innovation Council strongly recommended strengthening the UH's partnerships with other sectors, including the state's political leadership, the private sector and other universities. Such partnerships between large firms, small firms, universities, and government could yield tangible results.

In drawing the conference to a close, President Greenwood added a note of caution about Hawai'i's ability to accelerate quickly with a new strategy of technological innovation and commercialization. "This is not the first time for much of what we are proposing," she said. The state developed a similar plan 15 years ago when a governor's task force reported that University of Hawai'i should be the economic engine for the state and should begin to commercialize some of its research, but that plan was not implemented. "The challenge is to do what we know we have to do," she said, emphasizing the need to act based on the recommendations of the 2011 Hawai'i Innovation Council Report.³

The findings of the Innovation Council and the outcomes of the January 2011 HI² Symposium were published by the National Academies of Science in early 2012². Those findings provided a detailed roadmap for UH leadership in the development of an innovation economy in Hawai'i that integrated the UH research enterprise with government and the S&T industry across the state. Now framed under an innovation ecosystem, issues such as education, investment capital, technology transfer and entrepreneurship training were poised to provide a broader landscape for a state S&T Plan.

In the summer of 2011, the HSTC closed its doors and the S&T Plan committee lost its primary conduit to the state's technology industries. With the release of the National Academies of Science report, emphasis of coordination of the technology landscape in the state was shifting to a new set of stakeholders around an innovation economy. The EPSCoR S&T effort now focused on an update of the 2010 S&T Framework in preparation for submission of a new 5-year, \$20M proposal to the NSF in late summer 2013.

² National Research Council (US) Committee on Competing in the 21st Century: Best Practice in State and Regional Innovation Initiatives. Building Hawai'i's Innovation Economy: Summary of a Symposium. Washington (DC): National Academies Press (US); 2012. Hawai'i's Innovation Strategy, Available from: <http://www.ncbi.nlm.nih.gov/books/NBK99287/>

³ <http://www.ncbi.nlm.nih.gov/books/NBK99287/>

The new S&T framework, *Sustaining and Improving Quality of Life for a Prosperous Hawai'i: A Statewide Framework for Science and Technology* was submitted to the Hawai'i EPSCoR Statewide Committee in June 2012 and accepted by the Governor's Office later that month. It highlighted key challenges that Hawai'i must address and opportunities it can utilize to develop and sustain the state's science and technology sector. It provided a pathway for sparking conversations and actions that would bring to bear the latest knowledge and technology to grow, diversify and strengthen a resilient state economy, and improve the overall quality of life for Hawai'i residents. It is also served as a planning and coordination guide for state and local governments, businesses, and the education sector to mobilize the state's assets to advance this agenda, and built upon previous reports and analyses on science, technology and innovation in Hawai'i.

EPSCoR was unsuccessful with NSF RII Track-1 proposal submissions in both 2013 and 2014. During that time UH appointed a new EPSCoR Project Director, Dr. Gwen Jacobs. Dr. Jacobs joined UH from Montana, another EPSCoR jurisdiction and had extensive experience on both the NSF and National Institutes of Health EPSCoR programs. In 2014, she reconvened a new EPSCoR Hawai'i Statewide Science and Technology Committee (HSSTC, Table 4) with a mission to "act as an independent organization on behalf of the broader research, business and government interests of the

Table 4

EPSCoR Hawai'i Statewide Science and Technology Committee 2014

Chairs:

Dr. David Lassner, President, University of Hawai'i System

Mr. Shan Tsutsui, Lt. Governor, State of Hawai'i

Members:

Dr. George Ka'iliwai III, Director, Resources and Assessment, J8, U.S. Pacific Command

Mr. Nelson Kanemoto, CEO & President, Referentia Systems Inc.

Ms. Karen Lee, Associate VP & Exec. Director, Hawai'i P-20 Partnerships for Education

Mr. Richard Lim, Director, Dept. of Business, Economic Development & Tourism (DBEDT)

Ms. Kathryn Matayoshi, Superintendent, Hawai'i State Dept. of Education (DOE)

Dr. Vassilis Syrmos, Vice President for Research & Innovation, University of Hawai'i System

Dr. Patrick Sullivan, CEO, Oceanit

Mr. Richard Wacker, President & CEO, American Savings Bank

Dr. Helen Turner*, Dean of natural Sciences and Mathematics, Chaminade University of Honolulu

Ms. Leslie Wilkens, Vice President, Maui Economic Development Board

Dr. Hank Wuh, CEO, SKAI Ventures

Ms. Susan Yamada, Executive Director, Pacific Asian Center for Entrepreneurship (PACE)

* Denotes Vice-chair

Ex-Officio Members:

Dr. Donald Straney, Chancellor, University of Hawai'i at Hilo

Dr. Gwen Jacobs, Director of Cyberinfrastructure, University of Hawai'i System and Project Director, NSF EPSCoR

Mr. Kevin Kelly, Managing Director, Hawai'i EPSCoR Program, University of Hawai'i System

State of Hawai'i." The Committee promotes innovation, collaboration, and excellence towards the goals of a world-class research and development enterprise in Hawai'i that is an engine for economic diversification, prosperity and social justice."

The new HSSTC, with representation from a broad group of stakeholders in the Hawai'i S&T effort, is co-chaired by UH President David Lassner and Lt. Governor Shan Tsutsui. A new vice chair position has been created (Dr. Helen Turner, Chaminade University) with the remit (1) to act as primary liaison between the HSSTC and the 2016-21 NSF EPSCoR proposal team under the leadership of Dr. Gwen Jacobs, and (2) to provide day-to-day HSSTC leadership in the implementation of the three phases of activity outlined below, culminating in a ratified 2016-2021 State Science and Technology Plan (SSTP) by the end of 2016.

Specific tasks within the first years of convening the new HSSTC include, but are not limited to:

- **Phase I:** May 2015-August 2015: Re-ratification of the current (2010-2016) Statewide Science and Technology Plan to be submitted with the renewal application for support of the Hawai'i NSF EPSCoR program (due August 2015);
- **Phase II:** August 2015-April 2016: Framing of a new 2016-2021 vision for Hawai'i's statewide S&T effort, to be presented in a new draft SSTP that is updated, responsive to current priorities and representative of stakeholder input;
- **Phase III:** April 2016 onwards: New SSTP development, ratification, and implementation in collaboration with diverse stakeholders in the state's research, education and enterprise activities.

Phase I is underway, with the following activities slated for 2015-16:

- A new, \$20M, Hawai'i EPSCoR Track I proposal, with a proposed 2016-2021 funding period (Principal Investigator Dr. Gwen Jacobs) was submitted in September 2015. The proposal, entitled *RII Track-1: Ike Wai: Securing Hawai'i's Water Future*, focused on Hawai'i's hydrology and water economy and is currently under review at NSF;
- Two HSSTC meetings (July 2015 and January 2016), with agenda items including: (a) restatement of Bylaws and HSSTC mission, (b) review of EPSCoR proposal goals and potential impact, (c) ratification of a provisional statewide S&T plan, (d) overview of timeline for revision of statewide S&T plan;
- Review of statewide S&T plans in other EPSCoR states and selection of plans for consideration as models for the revised Hawai'i plan;
- Host stakeholder engagement "listening visits" which will take place in mid-Phase I (Winter 2015-6);

- EPSCoR principal investigator Jacobs was been appointed to the EPSCoR/IDeA Coalition Board of Directors and will convene all IDEA (National Institute of Health's Institutional Development Award) program leadership in Hawai'i (EPSCoR, COBRE, INBRE) to discuss integration and streamlining of efforts around the revised S&T Plan.

Summary

The current EPSCoR S&T Plan (Appendix 3) will be updated over the next several months to more closely align with the University of Hawai'i Strategic Directions, 2015-2021⁴ and language will be changed to reflect the current S&T environment of the state. The national metrics on the states S&T performance will be updated and new recommendations will be reassessed.

While revisiting this plan is beneficial to the EPSCoR program, the plan can still serve as a framework for broader coordination of state S&T resources and investments. The current State Plan still does not recognize the increasingly important emphasis on knowledge-based, innovation-driven industries that require skills in science, technology, engineering and math (STEM), as well as broad-based skills in critical and analytical thinking, effective communication, and teamwork. More importantly a statewide plan, with the full support of the governor and legislature, could align strategic priorities across various state stakeholder agencies such as DBEDT, DLNR and DOE.

There still exists a critical need for a comprehensive statewide S&T strategic plan that will provide policy makers, industry, academic leaders, and the general public with a road map for capitalizing on the potential of Hawai'i's S&T industry sectors to contribute to an economy based on innovation and the development of human capital. Across the country elected officials recognize that economies grounded in science and high technology have found success through: a) a workforce that is well-educated; b) industries that are competitive on a national and international scale; and c) the expansion of the tax base through the creation of locally owned innovation businesses that are created by or engaged by S&T-focused entrepreneurs that provide competitive salaries for their employees.

⁴ <http://www.hawaii.edu/strategicdirections/>