The California State University
COUNCIL ON OCEAN AFFAIRS, SCIENCE AND TECHNOLOGY

COAST Six-Year Strategic Plan, 2009-2015
February 2010

Executive Summary

California's 1,100 mile coastline represents the interface between two worlds that are now rapidly changing. It is at this interface that a complex series of terrestrial, atmospheric and marine processes interact with economic and cultural forces all within a diverse and changing socio-political matrix. It is also along this boundary that over three-quarters of the state of California's population lives and works. The interactions at this interface directly impact a $43 billion ocean economy upon which the citizens of California and the nation heavily rely. The common integrating feature, and the value upon which the beneficial and sustainable outcome of these interactions depend, is environmental quality. Because of its inherent complexities, responsible and sustainable solutions to problems facing California's coastal systems require novel multidisciplinary efforts. The implementation of emerging innovative solutions also requires an educated populace that can appreciate and understand both the complex environmental challenges and the value of emerging efforts to meet them. The current workforce of California is ill prepared to meet these challenges (Science Literacy in California, Ocean Science Literacy Campaign).

The California State University (CSU) can play a key role that will provide the necessary transformations in sustainable environmental science needed by the State. The CSU Council on Ocean Affairs, Science and Technology (COAST) was established in 2008 to integrate system-wide resources and promote interdisciplinary multi-campus collaborations to advance our knowledge of California's natural coastal and marine resources and the processes that affect them. COAST is uniquely positioned to provide a statewide coordinated response to these environmental challenges through 1) the promotion of interdisciplinary research programs focusing on specific processes of basic science and societal relevance in the coastal region, 2) the facilitation of collaborative interactions between faculty and students across the CSU, leveraging the capabilities of the CSU as a whole through the sharing of resources and information, 3) the formation of a system-wide brain-trust that can respond rapidly to questions from policy makers and regulators, and 4) education and the advancement of environmental literacy throughout the workforce of California. This Strategic Plan describes the compelling needs driving the formation and the goals of the COAST program from 2009 to 2015. In addition, benchmarks for achievement are described providing metrics against which to evaluate the program's performance. This is a living document that is to be reviewed and revised annually. It is the intent of the COAST leadership that this organization will enable the transformation of the California workforce into one that incorporates the ethic of science-based earth stewardship into the development of profitable and sustainable solutions to current and future problems. These demonstrated solutions can then be propagated across coastal communities throughout the nation.

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Introduction

The California Coastal Phenomenon

The California coast is bathed in waters of the California Current and Davidson Countercurrent systems spanning three separate and distinctive biogeochemical and biogeographical provinces: waters south of Point Conception; Point Conception to Point Reyes, and Point Reyes northward with major macrophyte, invertebrate and fish abundances distributed differentially between these regions. These waters represent some of the youngest and oldest found on the globe (Feeley et al., 2008). Waters upwelling along the coast are rich in the products of microbial remineralization and high in nutrients, making the waters of coastal California some of the richest, most productive and diverse in the world. Reflecting the products of aerobic microbial respiration, these waters are low in dissolved oxygen and high in carbon dioxide, which periodically pushes their chemical composition to the survival limit of some species. These aquatic habitats are highly vulnerable to perturbations from acidification due to increasing atmospheric carbon dioxide (Feely et al., 2008), and eutrophication due to coastal runoff or changes in patterns of productivity, circulation and stratification (Stramma et al., 2008). In addition, California's coastal zone comprise the receiving waters, not only for natural rivers and streams, but for over 700 permitted dischargers and over half a million storm drains in the state of California.

The land itself exists at the boundary of two crustal plates (North American and Pacific) that dive underneath, and grind against each other along some of the most active faults on Earth. Strike/slip motion in some regions approaches 5 cm/year and processes of uplift and weathering shape the dramatic Coast and Sierra Nevada mountain ranges. Earthquakes and landslides in California characterize some of the most significant geohazards in the State and fires spreading across these steep and dry terrains periodically destroy vegetation over large areas rendering them susceptible to mudslides. Below the sea surface, the nature of the seafloor landscape and submarine features indicate a vast variety of habitats important for many marine species and resources that have been and continue to be extracted for human use. Thus, the biogeochemistry of ocean currents, the topography and bathymetry confer unique habitat along the California coast and also pose challenges for the organisms and people that live there.

The coastal zone of California is also the region where the majority of the State's population lives and works. Approximately 77% of the population lives within 20 miles of the coast (Kildow and Colgan 2005), and this population is extremely diverse and becoming increasingly so. Much of this diversity is driven by the abundance of opportunity in the State. The annual ocean economy of California in 2000 was estimated to be about $43 billion. This figure includes living and non-living resources, maritime transportation and port activity (40% of the nation's container traffic), coastal tourism and recreation. When all economic activity in California's 19 coastal counties is included, the coastal economy accounts for 85% of the gross state economic activity, or $1.15 trillion annually (Kildow and Colgan, 2005).

The waters off our coast and the prevailing winds control climate on land and give rise to some of the most productive and unique coastal redwood forests, rich and productive agricultural soils and a Mediterranean climate throughout much of the state. Although representing less than 2% of the terrestrial surface, this coastal Mediterranean climate supports more than 20% of the global terrestrial biodiversity.

Much of the economic vitality of California is linked directly to coastal environmental quality. Yet our coastal environmental quality is increasingly impacted by private, municipal, industrial and agricultural activities that are, in turn, tied to a complex matrix of anthropogenic and natural forcing functions. The combination of climate change, coastal erosion, sea-level rise, invasive species, harmful algal blooms, pollution, declining water quality, habitat loss and fragmentation, declining fisheries and ocean acidification represent a particularly complex and interrelated dynamic that leads to reduced public access to and to the devaluation of California's marine resources. This is not just a coastal feature—all areas of the marine environment are negatively impacted by humans, with 41% of these areas considered to be strongly impacted (Halpern et al., 2008). These impacts are likely to lead to greater negative effects, not only on the marine organisms that live in these waters, but also on human health and the economy. The importance of these issues has been realized both nationally (Pew Oceans Commission, 2003; U.S. Commission on Ocean Policy, 2004; Intergovernmental Panel on Climate Change, 2007) and at the state level (California Resources Agency and California Environmental Protection Agency, 2004; California Ocean Protection Council 2006; Gregoire et al., 2006). The influential factors and interactions responsible for these changes, and the future effects they will cause, are not well understood, nor are there available models that can predict marine environmental change with the accuracy necessary to inform policy or environmental management decisions.

The Need

The need to understand these problems is great and is scientific as well as socio-political and economic. Intellectual resources are needed in order to bridge the gap between information and knowledge and to develop innovative approaches to integrate and synthesize current environmental data. The understandings that emerge from the network of observational and experimental data should be used to increase public awareness of these complex systems, develop predictive models of environmental change and inform those who make decisions regarding coastal resources. We need to bring our latest understanding of the coastal environment to the people of California whose livelihoods depend upon environmental quality. In this way fact-based policy, informed by the best available science, can be developed and appropriate and effective decisions made. An environmentally literate, highly skilled and technically capable workforce is needed to effectively apply this knowledge to decision-making processes.

The California State University in Context: A High Leverage Educational System for Increasing Diversity and Developing Innovative Solutions to Environmental Problems

The California State University (CSU) is the largest public university system in the western hemisphere. With almost half a million students annually, and 48,000 faculty and staff, the CSU is responsible for training the majority of the workforce, business leaders and teachers in California (ICF Consulting, 2005). The CSU is also a leading source in California and nationally for the life science workforce prepared at the baccalaureate and masters' degree level.

The CSU is also highly diverse. More than 50% of its students are non-white, and more than two-thirds of CSU campuses are recognized as Hispanic Serving Institutions (HSIs). The CSU graduates the majority of African-American, Latino, and American-Indian students in California, more than all other public and private institutions of higher education in the state (IFC Consulting, 2005). A significant percentage of CSU students are federal Pell grant recipients (more than 30% of students at more than half of the CSU campuses). Many CSU students are the first in their family to participate in higher education, and/or come from groups historically underrepresented in Science, Technology, Engineering, and Mathematics (STEM) disciplines. These groups increasingly participate in the leadership of the State. The CSU's mission includes increasing the participation of underrepresented groups in the sciences. Also, many CSU students speak languages other than English, and are culturally competent in a variety of settings.

The CSU is also pivotal in developing the pipeline for future K-12 teachers. More than half of California's mathematics and science teachers are prepared by the CSU (California Commission on Teacher Credentialing, 2007). The CSU has pledged, through its Mathematics and Science Teacher Initiative, to double the number of mathematics and science teachers prepared from 750 per year to 1,500 per year. This aggressive growth is paired with an increase in professional development support and outreach to potential teachers. Excellent, engaged K-12 teachers in science disciplines act to motivate and engage their students in considering STEM disciplines for study and future careers. Environmental literacy with an emphasis on coastal processes must become a key part of CSU teacher training programs so that it can ultimately be communicated to the K-12 students who are our future. An environmentally literate workforce will lead to innovations in sustainable resource management that could reverse the current pattern of environmental degradation within a generation.

The CSU has campuses at 23 locations and biological field stations and marine laboratories at another 22. The majority of these 45 locations are near the coast. This is remarkable geographic coverage that provides unprecedented opportunity to engage all CSU stakeholders with access are resources deployed throughout coastal California. Of the 23 campuses, all but two have programs related to marine science and faculty with marine

science interests are at all campuses. In composite, the CSU also has a significant fleet of research vessels, analytical instrumentation, labs and programs the coordination of which would dramatically increase coastal research and access to study sites for faculty and students from a wide spectrum of disciplines across the CSU.

The CSU has the opportunity to become the “go-to” institution for practical, scientifically sound solutions to current and anticipated environmental problems. As these solutions are implemented throughout the State and the nation, California and the CSU will be recognized as leaders in environmental problem solving. California and the country will benefit from the collection of resources (intellectual, analytical, infrastructural) that the CSU will dedicate to solving problems of societal relevance. The CSU Council on Ocean Affairs, Science and Technology (COAST) was established in 2008 to integrate system-wide resources and promote interdisciplinary multi-campus collaborations to advance our knowledge of California’s natural coastal and marine resources and the processes that affect them. Given the power of the CSU in sheer numbers, resources and talent, COAST will make significant impacts and become a State and national leader in addressing coastal environmental challenges.

COAST Mission

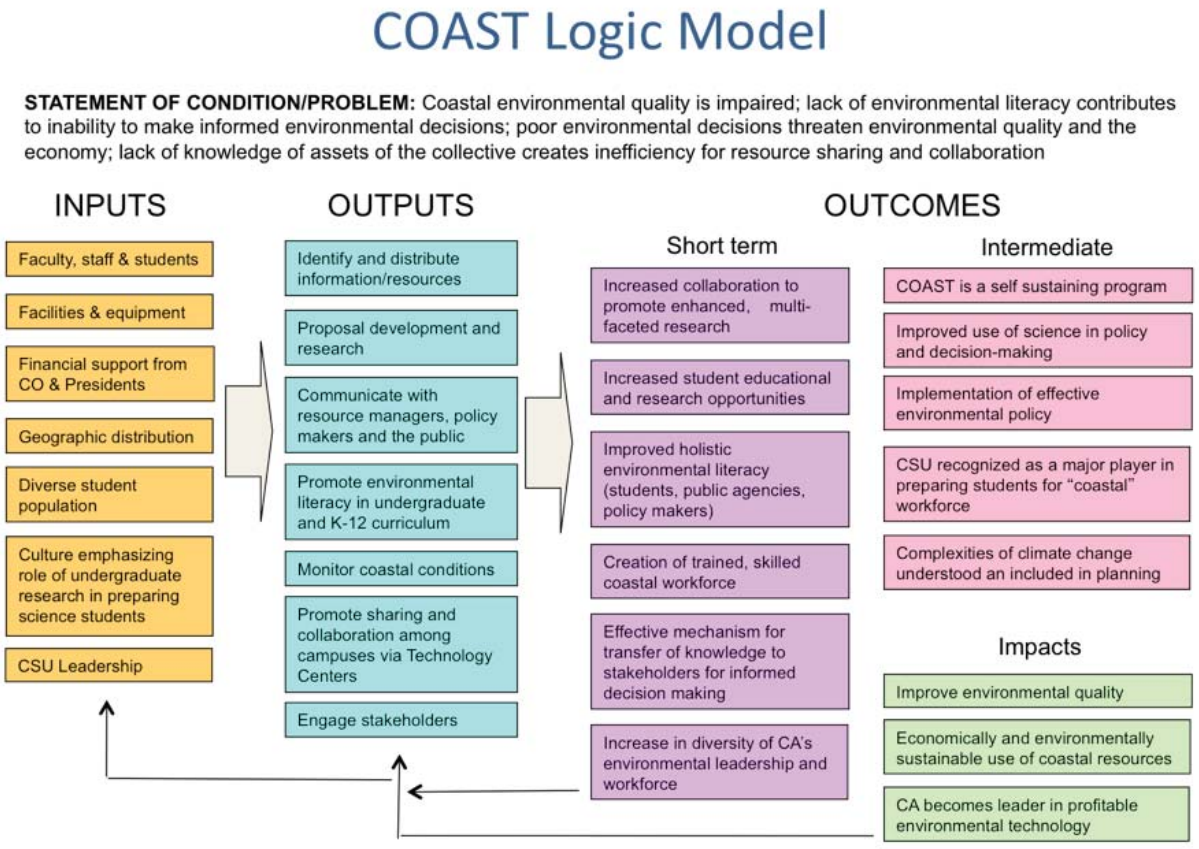
To provide vision, leadership, and support throughout the CSU system for education, policy and research related to California's marine, estuarine, and coastal regions, and to promote the public dissemination of knowledge gained to foster stewardship and sustainable use of California's coastal resources.

COAST Vision

COAST will enable the CSU to be a leader in coastal and marine-related research and environmental education throughout California, and will advance science and promote environmental literacy leading to a significant increase in stewardship informed by public awareness and understanding of our coastal and marine resources.

Logic Model

In order to guide the development of the strategic plan, the COAST interim Executive Committee developed a logic model based on the logic model process advanced by the University of Wisconsin, Extension Program. The logic model provides a statement describing the need for the COAST program, the activities of the COAST membership, and the desired short and long term goals. In addition, the logic model depicts the functionality of the organization and a metric against which to consider opportunities and actions and test whether such actions would be consistent with the outcomes and impacts desired by the program. It is from this model that the strategic plan was developed. The Logic Model depicted below shall act as the tool to evaluate the activities and directions of COAST. It shall be evaluated and revised annually to insure relevance to the mission of COAST and the effectiveness with which COAST serves the CSU and stakeholder groups.



COAST Goals

The goals articulated below reflect an ambitious course of action that will help drive the program towards success. It is our intent to execute these actions through both directed purpose, and opportunity as it may present itself. As such, the goals are more accurate in the short term and program flexibility is required in order to be responsive to the needs of the CSU faculty and funding calls as they are issued. Because of the interrelated nature of the processes impacting our coastal zone, the complexity of the forcing functions and the multiple levels at which both the problems and their solutions are manifest, COAST must develop a systems approach to this enterprise integrating faculty across both campuses as well as disciplines.

1) Promote the advancement of interdisciplinary coastal and marine-related research throughout the CSU.

Action: This will be achieved through incentivized research and professional development opportunities for CSU faculty engaged in coastal and marine education and research activities.

Metrics: Administer coordinated, multi-campus collaborative awards for competitive funding for research and education initiatives. This should involve awards to at least 20 successful teams of CSU investigators per year by 2015.

2) Become the brain-trust for those seeking information about, or novel solutions to, difficult problems in the coastal environment.

Actions: a) Develop a database containing CSU faculty information regarding faculty interests and areas of expertise. This database (Fresca) can be readily searched by key-words to provide a list of experts qualified to address certain areas of coastal resource management. Communicate the availability and power of this resource to agencies and representatives so that the COAST membership becomes a widely used resource for problem solving of issues important to the State. b) Develop legislative briefings on topics of specific interest to legislators, acquaint them with the COAST program and highlight the features of Fresca.

Metrics: Resource managers and regulators will increasingly use this database and/or those who have access to it, to provide guidance on issues of environmental importance.

3) Secure sustained funding for the management of the COAST administrative infrastructure.

Action: The goal of COAST is to serve the CSU and the people of California. Support by system-wide tithing with a match from the Chancellor's Office

is critical to the legitimacy of this organization. Yet, additional funding to advance COAST effectiveness is needed. COAST will serve as a vehicle for facilitating and obtaining external funding to support COAST faculty and COAST projects. Memoranda of Understandings (MOUs) will be developed among the CSU auxiliaries to facilitate the transfer of F&A funding to the COAST program in support of program development. Other sources of funding will be investigated.

Metrics: Increase in the number of proposals submitted and in external funding obtained by COAST faculty and COAST related projects. By 2015 all CSU auxiliaries will have MOUs that acknowledge the benefit of COAST to the success of their extramural programs. COAST will diversify funding to include several funding sources.

4) Develop the COAST Governance Structure.

Action: The COAST program is a faculty-enabling body that serves the needs for faculty development and curricular development, provides leadership in the areas of sustainable utilization of coastal resources, and is responsive to the needs of the CSU, policy makers and regulators. As such the COAST governance must be adaptable to changes in scientific priorities and funding opportunities, responsive to stakeholder and constituent needs, and sensitive to the needs of the faculty. COAST leadership must act in the interest of the faculty with the authority of the Campuses. As such, leadership recommends that two representatives from each campus shall be appointed by their respective Presidents with authorization to vote on behalf of their constituents. The COAST recommendation is that at least one of these representatives be a faculty member.

Metrics: A CSU-wide approved governance structure was adopted in the summer of 2009.

5) Enhance the educational opportunities for undergraduate and graduate students in the CSU, providing student involvement in on-going research projects.

Action: Provide support and shared facilities, instrumentation and mentoring capability to advance the quantity and quality of student undergraduate and graduate research in the CSU. Develop internship and mentored research opportunities at and through shared resources throughout the CSU, including NSF REU and RUI programs.

Metrics: Through focused grant activity, develop additional technological capabilities at CSU institutions, by 2010. Both the number of available opportunities and number of students and faculty participating in them will increase over time. Specifically, increase the number of CSU students making professional presentations and publishing papers on topics related to the mission of COAST.

6) Increase public awareness of the challenges facing our coast and increase stewardship of our resources.

Action: Hold public meetings and topic-specific symposia and workshops, both live and broadcast over the web. Provide web-based outreach to K-12 and University stakeholders as well as the public regarding emerging issues relevant to coastal environmental quality.

Metrics: Increasing attendance at annual meetings and increasing visits to the COAST website.

7) Develop programs to leverage CSU assets and increase the competitiveness of CSU faculty to successfully realize national and state funding for their research programs.

Action: Develop a database of CSU assets, linked to the Fresca database, that will provide information on capital equipment, facilities, services, and human resources available throughout the CSU and to outside organizations.

Metrics: The database will be increasingly accessed and utilized to increase the success of collaboration and the acquisition of funding.

8) Insure that the products of COAST related research and activities meet the needs of both the resource managers and the CSU.

Action: Engage scientists, resource managers and policy makers to ensure that the environmental data and products meet their needs. Hold periodic meetings that involve members of COAST and its stakeholder groups to critically evaluate the effectiveness of the COAST program and its goals. Provide feedback (as per the Logic Model) regarding intended outcomes and impacts of the COAST program.

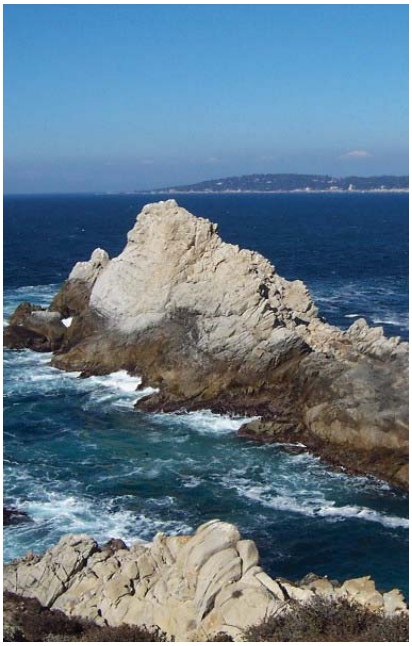
Metrics: Semi-annual meetings or conference calls will be held to evaluate the COAST program's effectiveness and provide for feedback regarding any changes to the COAST goals, objectives and strategic plan. These meetings will involve stakeholder groups, COAST membership and representatives from the CSU office of the Chancellor. Guidance from these meetings will inform the COAST governance structure regarding any necessary adjustments to the COAST priorities.

9) Develop modular curricula based on individual research programs, environmental data, marine technology and GIS for incorporation throughout the CSU in multiple disciplines (e.g., life sciences, public policy, business, teacher training).

Action: COAST will help to identify several funding opportunities (RFPs through NOAA, NSF, and other agencies) that can be used to fund

curriculum development. COAST will announce specific calls for faculty release time grants to develop proposals in response to these calls.

Metrics: By 2015, five proposals for curriculum development will have been funded and resulting curricula will be used in K-12 and CSU courses.



10) Provide opportunities for faculty and their students to conduct advanced research anywhere within the CSU and its auxiliaries.

Action: Establish MOUs between campuses that would allow for the accommodation of faculty and students at sister institutions and field stations throughout the CSU and other establishments (USC, UC, aquaria and other public and private institutions). This would also facilitate internship programs at government agencies, industry, and legislative offices.

Metrics: Faculty and students take advantage of these MOUs and conduct their research or carry out their graduate work at locations remote from their home campus.

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