

CALIFORNIA OCEAN  
PROTECTION COUNCIL

Staff Recommendation  
June 14, 2007

**California Shoreline Impacts Assessment Project**

Developed By: **Christine Blackburn**

**RECOMMENDED ACTION:** Consideration of the California Shoreline Impacts Assessment project and possible 1) determination that it is a high priority project and 2) authorization for the Ocean Protection Council's secretary to take actions necessary to provide up to \$500,000 for the initial phase of the project.

**NEAREST OCEAN OR COASTAL LOCATION:** Coastwide

**AGENCY OR ENTITY RECOMMENDING PROJECT:** Ocean Protection Council

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**RESOLUTION:**

"The Ocean Protection Council finds pursuant to Sections 35600 *et seq.* of the Public Resources Code that the California Shoreline Impacts Assessment project, as herein described, is of high priority for ocean conservation and authorizes the council Secretary to take actions necessary to provide up to \$500,000 for its implementation."

**PROJECT SUMMARY:**

Staff is recommending that the Ocean Protection Council (OPC) determine that the proposed California Shoreline Impacts Assessment project is a high priority for ocean conservation. The project consists of two components that will collectively provide coastal managers the data needed to better predict and plan for coastal change in California during the next 10-100 years. The project components include (I) basic research, in cooperation with the California Energy Commission (CEC), on coastal processes and (II) the creation of new data, reports, analyses, and decision tools useful for coastal managers.

In light of climate change and sea level rise predictions, the difficult decisions that already face coastal managers will become even more complicated in the future. Many coastal processes are subject to change based on various sea level rise scenarios. Managers will need to understand these changes within the larger context of individual management decisions, including:

- Assuring public access—eroding beaches and increased coastal armoring may result in residents and tourists alike having fewer locations to enjoy coastal recreational

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opportunities, ultimately impacting California's coastal tourism economy

- Determining the potential fate of large-scale habitat restoration projects—sea level rise may affect the types of native and non-native species that thrive in coastal wetlands; understanding these changes should shape restoration planning now and into the future
- Conducting beach re-nourishment projects—over the past 10 years state, local, and federal agencies have spent significant dollars to replenish eroding beaches with sediment from other locations; if coastal processes in the future erode these areas at increasingly higher rates, additional cost effective beach management techniques may be necessary
- Protecting essential public infrastructure—as sea levels rise, public infrastructure such as roads, sewage treatment plants, and power plants may be at higher risk of flooding; decisions will have to be made about whether structures should be protected or rebuilt at a safer location
- Planning for future development—understanding the potential shape of our coastline in 50-100 years can help city and state planners make better long-term decisions regarding development in the coastal zone

In the near future, cities and counties will likely begin to incorporate projections of sea level rise impacts into their coastal plans. State planners are already pursuing methods for considering sea level rise and climate change impacts in permits, other regulatory actions, and restoration projects. The proposed project will provide managers at all levels with the essential information and tools needed to incorporate sea level rise effects and changing coastal processes into long-term coastal planning.

### **Background**

The California coastline is very dynamic, constantly eroding in some places, accreting in others, and reacting to the changes in sediment transported along the coast. In May 2007, the U.S. Geological Survey (USGS) released a report that examined historical erosion rates throughout the state. The findings showed the average cliff retreat in California over the last 70 years has been about 0.3 meters/year. However, some areas have experienced much higher rates of retreat: an area north of Pillar Point Harbor has retreated 210 meters in 70 years and an area near Santa Monica moved 115 meters inland during the same period.

Changing coastlines are not a new phenomenon in California. However, with coastal populations continuing to grow, the impacts of coastal change are becoming more costly. Community infrastructure and private property are threatened by cliff erosion, flooding, and storm impacts. Climate change effects will likely accelerate or intensify these processes during the next century, exacerbating the problem. In 2003, James Newman and others from Industrial Economics estimated that it will cost \$148 to \$635 million to protect vulnerable areas in California over the next 100 years if California experiences a 100cm sea level rise. However, this study was scaled statewide from assessments conducted at only seven sites and only considered the cost of protecting or abandoning existing infrastructure. Other factors were not included such as secondary effects to the coastal economic or ecosystem services provided by wetlands and other natural features that may be adversely impacted by decisions to protect structures. The true cost to the state is still unknown.

One of the most difficult problems facing geologists and managers today is predicting the physical response of the coastline to natural processes, different management actions, and the

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added impacts of sea level rise. Predicting shoreline and cliff retreat, beach loss, and land loss rates are critical to planning coastal zone management strategies, assessing potential biological impacts due to habitat change or destruction, and limiting harmful economic impacts in the coastal zone.

Presently, no standard practice or methodology exists for predicting coastal change and incorporating these changes into long-term coastal plans. Compounding the issue, essential data do not exist in some cases or are not accessible to coastal managers in useful forms. The proposed California Shoreline Impacts Assessment project will address some of these data and application gaps, and will help set standard methodologies for assessing these potential impacts throughout the state.

Many coastal studies have already been conducted in California; the components of this project will build off the programs and studies that are already ongoing. In terms of climate predictions, Our Changing Climate (2006) provided a valuable initial overview of climate impacts on key sectors in California under alternative greenhouse gas emission scenarios. The report included rising sea levels as one of the major impacts, along with impacts to public health, water resources, agriculture, and others. New information about climate change scenarios and sea level rise projections are also available from the Intergovernmental Panel on Climate Change (IPCC) in its fourth assessment report, Climate Change 2007.

In relation to coastal processes and the status of coastal resources in California, many reports and databases also currently exist. Some key studies include:

- National Assessment of Shoreline Change Part 4: Historical Coastal Cliff Retreat along the California Coast (USGS 2007)
- National Assessment of Shoreline Change Part 3: Historical Shoreline Change and Associated Coastal Land Loss Along Sandy Shorelines of the California Coast (USGS 2006)
- USGS GIS Compilation of Vector Shorelines and Associated Shoreline Change Data for the Sandy Shorelines of the California Coast
- USGS GIS Compilation of Vector Cliff Edges and Associated Cliff Erosion Data for the California Coast
- Shoreline armoring inventory (Coastal Commission 2006)
- Index of coastal vulnerability to erosion (USGS 2001)
- Development of Sand Budgets for California's Major Littoral Cells (Patsch and Griggs 2007)
- Littoral Cell, Sand Budget, and Beaches; Understanding California's Shoreline (Patsch and Griggs 2006)

However, even with these data available, coastal managers are not always able to connect this information to their work. In 2006, Susanne Moser from the National Center for Atmospheric Research conducted a survey of coastal managers in California regarding climate change impacts and whether agencies were incorporating potential impacts into planning decisions. The results showed that most planners believed coastal erosion, coastal flooding, beach loss, public access, habitat protection, and saltwater intrusion were important issues facing the coast, and several believed the severity of problems associated with these impacts would likely increase in the future. Yet few managers dedicated much time to addressing these issues. The report identified

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monetary constraints and limited staff resources and time as major hurdles to more adequately addressing climate issues in the long term. The proposed California Shoreline Impact Assessment project is designed to provide needed data—in easy-to-use formats—to state and local managers so that time and resources constraints are reduced.

### **Project Description**

There are two components of the proposed California Shoreline Impact Assessment project. For component I, the OPC will work with the California Energy Commission (CEC) to conduct research on sea level rise projections. This research project meets OPC goals and also has been chosen by the CEC as a priority project.

For component II, the OPC will help support needed research and stimulate the conversion of existing information into reports, analyses, and decision tools useful to coastal managers. This will be achieved through the release of a competitive request for proposals (RFP) for a wide variety of projects that may include research into existing data gaps, shoreline management plans; interactive, easy-to-use decision support tools; and other products that afford managers easy access to sea level rise impact data and scenario analyses relevant to long-term management decisions.

### **I. Research on coastal processes and economic effects**

Certain research can set the stage for other essential work specific to coastal managers' needs. In particular, statewide standard climate projections and sea level rise estimates will allow all managers to work from the same information. In addition, this information will set the stage for other work that the OPC could support in the future.

These goals match well with the work currently being pursued by the CEC climate research program and the California Environmental Protection Agency (CalEPA). To update the 2006 climate scenarios report (Our Changing Climate), the CEC and CalEPA have identified essential information gaps that will need to be addressed. The goals for the update include:

- Refining the regional climate projections to more fully capture changes in variability and start characterizing likely climate changes. These projections will be invaluable for developing adaptation strategies and assessing economic risks.
- Applying climate change projections to assessments of broader social changes, such as land-use changes and demographic shifts.
- Determining climate change adaptation strategies and how different strategies might affect one another.

By working with the CEC on joint projects, the OPC can support the update to Our Changing Climate and fund research projects that also address the goals of the OPC. One project (described below) was chosen from the information needs highlighted by the CEC and CalEPA. This project will also produce data and products useful to the OPC and other coastal management agencies.

#### A. Updates to California Sea Level Rise Projections

Scripps Institution of Oceanography, \$100,000

The study will derive sea level rise directly from climate model simulations. Generally, global climate models do not provide estimates of the total sea level rise because they omit ice melt

from land-based ice masses such as Greenland or Antarctica. In addition, broad ranges of estimated sea level rise are only loosely connected to a given climate change model simulation, but new methods will allow for a more complex and detailed assessment. Driven by the output from a set of climate change simulations, new scenarios will be generated that include tides, weather, and short period climate (El Niño phenomena) components as well as long-term rise. The results will provide hourly sea level projections from present day to 2100 for key index stations along the California coast. For open coast locations, projected sea level will be studied to estimate potential changes in the occurrence of extreme events. This study will result in new data that will aid in updating the Our Changing Climate report in 2008. The data will also be available to the OPC and other state and local agencies for long-term planning in California.

## **II. Creating useful plans, analyses, and decision tools for coastal managers**

The remaining funds will be used to fund projects that assess and predict shoreline change and sea level rise impacts in California, examine potential socioeconomic impacts to coastal California, and provide information to managers. Projects will be solicited through an RFP process and selected on the basis of relevance to future coastal management and whether they provide useful products for coastal managers. OPC staff has already talked to several state agencies, such as the Coastal Commission, State Lands Commission, Department of Boating and Waterways, and State Parks to discuss some of their data needs. In addition, staff plans to consult with relevant state and federal partners—including the Climate Action Team, the CEC, USGS, Army Corps of Engineers, and others—while drafting the RFP to ensure that desired outputs are encouraged.

Following the solicitation, OPC staff will convene a proposal review panel composed of state agency and other representatives who will be the intended users of the resulting data. This will allow these agencies to assess the potential outcomes and rank them according to their individual needs.

The information the OPC will seek through this project will help state agencies create more robust adaptation strategies to potential climate change impacts. Pursuing individual projects through an RFP process will allow the OPC and other state agencies to weigh the pros and cons of each approach and choose the most useful data for informing daily decisions. Examples of useful products include shoreline management plans (regional approaches to managing potential erosion impacts), interactive decision tools (mathematical models of the coastal zone that can predict future conditions based on different input criteria), and inundation and other predictive maps, potentially focusing on extreme events. Additional projects that result in new products, more complete or up-to-date data sets, or new applications of data will be encouraged. Research on socioeconomic and demographic impacts will also be encouraged to complement the research sponsored by the CEC.

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### PROJECT FINANCING

#### Possible Funding Sources:

Coastal Conservancy	<u>\$500,000</u>
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<b>Initial Project Cost</b>	<b>\$500,000</b>
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Staff anticipates using OPC's tidelands oil funds, appropriated to the Secretary of Resources in the FY 04/05 budget for projects authorized pursuant to the Ocean Protection Act. The Resources Agency has entered into an interagency agreement with the Conservancy to administer these funds on behalf of the council.

Staff anticipates that a portion of the funds (\$100,000) will be disbursed in the form of a contract to Scripps Institution of Oceanography (University of California Regents) to conduct the sea level rise projections study. The remaining funds (\$400,000) will be expended on projects selected through the RFP (component II of the project). If additional funds are needed to complete priority projects selected through the RFP process, staff will return to the council at the October meeting (or later) to request additional funding.

**CONSISTENCY WITH OCEAN PROTECTION COUNCIL'S FIVE-YEAR STRATEGIC PLAN:** The proposed project is consistent with two of the objectives within Section II-D of the Council's Strategic Plan—Physical Processes and Habitat Structure.

**Objective 2: Support the implementation of regional sediment management throughout California as a means of protection, restoring, and enhancing California's coastal sediment and beach resources.**

The OPC will work with the Regional Sediment Management Workgroup, Coastal Commission, USGS, Army Corps, and others during the RFP process. The data and tools provided by the projects funded through the RFP will allow all state and federal agencies to take a broader, regional view of coastal sediment transport, erosion impacts, and changes to other natural coastal habitats.

**Objective 3: Support state efforts to detect the impacts of climate change and develop strategies to respond to them.**

The project allows the OPC to work with the Climate Change Action Team, CalEPA, and the CEC to better predict climate impacts in the coastal zone. In addition, the OPC will work with state, federal, and local managers to identify and address their data needs for making more informed decisions about land use, restoration projects, coastal developments, and beach renourishment in light of future climate change impacts.