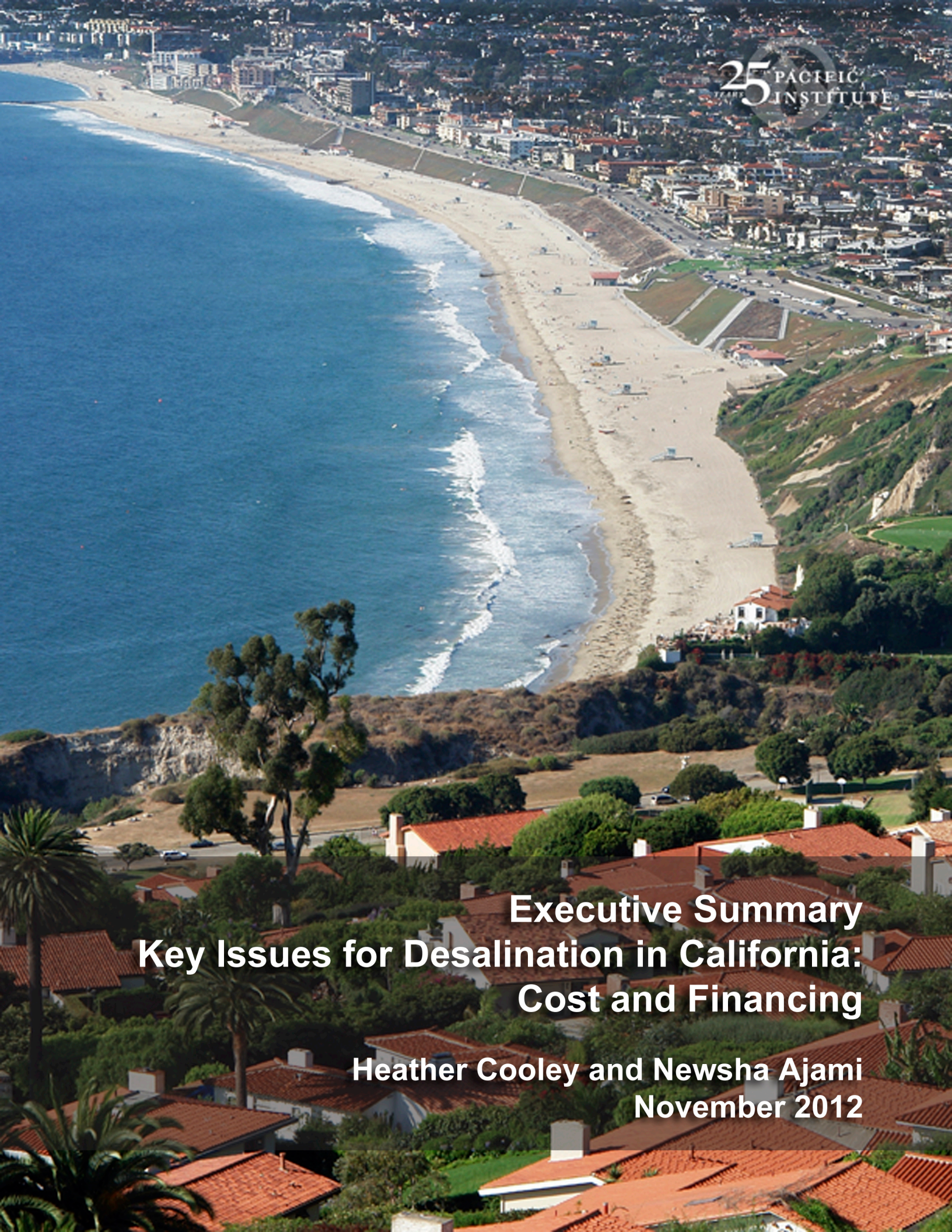


# Executive Summary
# Key Issues for Desalination in California: Cost and Financing

Heather Cooley and Newsha Ajami

November 2012

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## About the Pacific Institute

The Pacific Institute is one of the world's leading nonprofit research and policy organizations working to create a healthier planet and sustainable communities. Based in Oakland, California, we conduct interdisciplinary research and partner with stakeholders to produce solutions that advance environmental protection, economic development, and social equity – in California, nationally, and internationally. We work to change policy and find real-world solutions to problems like water shortages, habitat destruction, global warming, and environmental injustice. Since our founding in 1987, the Pacific Institute has become a locus for independent, innovative thinking that cuts across traditional areas of study, helping us make connections and bring opposing groups together. The result is effective, actionable solutions addressing issues in the fields of freshwater resources, climate change, environmental justice, and globalization. More information about the Institute and our staff, directors, funders, and programs can be found at www.pacinst.org.

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# Table of Contents

# Figures



# Tables

# Executive Summary

In June 2006, the Pacific Institute released *Desalination, With a Grain of Salt*, an assessment of the advantages and disadvantages of seawater desalination for California. At that time, there were an estimated 21 active seawater desalination proposals along the California coast. Since then, only one project, a small plant in Sand City, has been permitted and built. A second plant, in Carlsbad, has had all of the necessary permits in place since 2009 but has not yet secured financing. Interest in seawater desalination, however, remains high in California and many agencies are conducting technical and environmental studies and pilot projects to determine whether to develop full-scale facilities.

Beginning in 2011, the Pacific Institute initiated a new research project on seawater desalination. As part of that effort, we conducted some 25 one-on-one interviews with industry experts, water agencies, community groups, and regulatory agencies to identify some of the key outstanding issues. Throughout 2012 and 2013, we are producing a series of research reports that evaluate key outstanding issues for seawater desalination projects in California. The first report, released in July 2012, provided an update of the proposed seawater desalination projects along the coast of California. In this report, the second in the series, we provide detailed information about the cost of seawater desalination projects, how they are financed, and some of the risks associated with these projects. Other issues that will be addressed in future reports include the marine impacts of seawater desalination, the energy requirements and associated greenhouse gas emissions of desalination, and an overview of the permitting process.

## How Much Does Seawater Desalination Cost?

Economics – including both the cost of the water produced and the complex financial arrangements needed to develop a project – are key factors that will determine the ultimate success and extent of desalination in California. Our analysis finds that the cost to produce water from a desalination plant is highly variable. Recent estimates for plants proposed in California range from $1,900 to more than $3,000 per acre-foot, or $1.54 - $2.43 per cubic meter ($m^3$). While the cost of seawater desalination has declined considerably over the past 20 years, desalination costs remain high and there are unlikely to be any major cost breakthroughs in the near- to mid-term. Indeed, desalination costs may increase in response to rising energy prices.

The public and decision-makers must exercise caution when comparing cost estimates for different seawater desalination projects. In many cases, costs are reported in ways that are not directly comparable. For example, some report the cost of the desalination plant alone, while others include the additional infrastructure, e.g., conveyance pipelines, needed to integrate the desalination plant into the rest of the water system. Some estimates include the cost to finance the project, while others do not. Even when there is an apples-to-apples comparison, there are a number of site- and project-specific factors that make cost comparisons difficult, such as energy, land, and labor costs.

Furthermore, costs associated with wastewater conveyance and treatment are often excluded from desalination cost comparisons. The introduction of a new source of water increases the amount of wastewater that must be collected, treated, and disposed. Some communities may have adequate wastewater treatment capacity and the additional costs would simply be the variable O&M costs associated with that treatment. In other communities, however, wastewater treatment capacity may need to be expanded, which represents an additional, and in some cases significant, capital cost to the community. While these costs would apply to all of the water supply projects under consideration to meet demand, these costs would not be incurred if water demand was met through water conservation and efficiency improvements.

## How Are Seawater Desalination Projects Financed?

The construction of a desalination plant is expensive and requires considerable up-front capital investment. To cover these costs, project developers often rely heavily on debt financing, which involves borrowing money from a lender with the intent of repaying the principal of that debt and interest. Although still relatively uncommon within the water sector, project developers are also turning to private equity financing – whereby an investor provides capital for the project in exchange for partial ownership of the desalination plant.

For most of the proposed projects in California, the financing mechanism has not yet been determined. Desalination projects that are being developed solely by public water agencies will likely use municipal revenue bonds or other conventional financing methods. Additional support may be provided through government grant and loan programs. Nine of the proposed plants in California, however, may be entirely or partially financed and owned by private companies, and these projects will likely use some combination of debt financing, especially tax-exempt private-activity bonds, and private equity. These public-private partnerships can allow for a mechanism to attract private investment and share some of the risks associated with a project. One of the possible drawbacks in private sector financing, however, is the high cost of private capital, which is reflected in the price of desalinated water. Proponents of this approach, however, argue that the higher costs are offset by lower risk for the water provider, higher efficiency of the contractor, and technology performance guarantees.

## What Are Some of the Risks Associated with Seawater Desalination Projects?

There are several risks associated with seawater desalination projects that can affect the cost of the project, ability to attract financing, and overall viability of the project. Many of these risks are not unique to seawater desalination projects – rather they apply broadly to all major infrastructure projects. These include risks associated with permitting, construction, operations, and changes in law.

But as recent experience in the United States and Australia has shown, desalination projects entail risks specific to large water-supply projects, including demand risk. Demand risk is the risk that water demand will be insufficient to justify continued operation of the desalination plant due to the availability of less expensive water supply and demand management alternatives. In Australia, for example, four of the six desalination plants that have been developed since 2006 are being placed in stand-by mode. Likewise, the Tampa Bay Desalination Plant is operated considerably below full capacity because demand is lower than expected and less expensive water-supply options are available. Demand risk raises serious concerns about the size and timing of desalination projects, e.g., how big and when desalination plants should be built.

In some regions, seawater desalination can make an important contribution to the availability and reliability of water resources. However, it remains among the most expensive options available to meet water demands. Additionally, project developers may build large plants in an effort to capture economies of scale and reduce the unit cost of water. This can, however, lead to oversized projects that ultimately increase demand risk and threaten the long-term viability of a project.

## How Are Desalination Projects Structured?

Issues around financing and how project costs and risks are allocated are tied to how the project is structured. Many project developers in California are using some form of public-private partnerships. The private sector's involvement in seawater desalination projects is not new. The private sector has developed several small plants to supply high-quality water for specific industrial purposes, such as for use on oil and gas platforms. Likewise, a desalination project in Santa Barbara, completed in 1992, was operated and partially owned by a private company. In some cases, the private sector's involvement is limited to conducting feasibility studies and preparing environmental documents as requested by the public project developer. In other cases, however, a private entity owns and operates the desalination plant and sells water directly to a public agency. Public-private partnerships provide a mechanism to access private capital and allocate risks among the project partners. They can, however, be highly contentious due to concerns about openness and transparency of data and financial information and the allocation of the risk among the project partners.

Additionally, utilities that are developing seawater desalination plants must be sure that there is a demand for that water, especially when establishing minimum commitments under take-or-pay contracts. A take-or-pay contract provides guaranteed revenue for the seller but commits the buyer to a purchase even if actual demand drops. This exposes the buyer to demand risk – and provides a disincentive for water agencies to pursue more cost effective water supply and water conservation and efficiency programs.