

DESALINATION POLICY IN A MULTILEVEL REGULATORY STATE

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To visit the river quickly, cut an onion.
Nobody owns water.
Drink some and try to keep it.
Water rules kings.

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SUMMARY: I. Introduction. II. Desalination in the Contemporary United States. III. Desalination and the Context of U.S. Water Provision. IV. Federal and State Initiatives to Promote Desalination. V. An Example of the Issues Surrounding Large-Scale Municipal Desalination: The Huntington Beach (CA) Project. VI. Conclusion: Are There Lessons from the U.S. Experience? VII. Sources.

I. INTRODUCTION

The quest for new sources of potable water is emerging as one of the defining resource challenges of the twenty-first century. For the first time,

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desalination has recently emerged with a potential for widespread application even outside the Middle East where forms of it have long been practiced. In the parts of the United States facing impending water scarcity, some of the most ambitious plans for new desalination facilities are being developed. Even in settings where ample investment and advanced technological capabilities furnish the best possible conditions, however, the introduction of new desalination technologies has sometimes been problematic. Any attempt to draw lessons for the introduction of desalination in Mexico, China, or other developing countries needs to take account both of the institutional and other contextual conditions that have surrounded these new technologies in the United States, and of the continued difficulties that confront desalination there.

This paper offers an overview of the contemporary practice of desalination in the United States, and of the institutional context that is essential to understanding it. I then outline policies at the national and state levels that have aimed to encourage more widespread desalination, and the types of interests that have advocated these policies. A case study of the local and regional controversy surrounding one of the largest plants now under consideration serves to illustrate the debates and contestation that have greeted the new wave of desalination initiatives. The paper concludes with a discussion of the current prospects for introduction of desalination, and comparative observations about the conclusions that might be drawn from the U.S. case about introduction of desalination of this practice in Mexico and other developing countries.

II. DESALINATION IN THE CONTEMPORARY UNITED STATES

In parts of the United States, the politics of water scarcity has a long history. Such major cities as Los Angeles or Phoenix, built in the arid areas of the southwest, could only have grown into metropolises with the appropriation and importation of water from long distances. Perhaps the most dramatic story to come out of this era was the legendary saga of William Mullholland, the chief engineer of the Metropolitan Water District of Los Angeles. His seizure of water from the Owens River Valley and other sources in Northern California, combined with the engineering feat of the Los Angeles Aqueduct, took place through a remarkable combination of political intrigue, private speculation and even violence that

would later inspire the movie “Chinatown”. The resulting flow of water made possible the transformation of the Los Angeles basin from a semi-arid savannah into millions of lawns in the second largest urban region in the United States.

As urbanization and water scarcity have accelerated worldwide over the last fifty years, desalination has grown into a widespread practice with an increasing promise to address future needs. In 1952, 225 plants were operating with a total capacity of 27 million gallons per day. By 2002, 15 000 plants produced a capacity of over 4000 million gallons per day.¹ With more than 1200 plants, the United States currently has sixteen percent of total world capacity. Unlike in the Middle East, however, U.S. desalination plants have remained relatively small in capacity. Little of this capacity has also been put toward addressing the residential water needs of sizeable populations. Existing plants mainly carry out groundwater desalination than desalination of seawater, and produce desalinated water mostly for industrial uses. Only in a few exceptional, generally smaller communities, such as the small island of Catalina off the Los Angeles coast, have local water authorities used desalinated water for household water supply. Droughts in California in the 1980s led to a flurry of interest that generated plans for new plants, but when the droughts subsided a number of these were closed over the early 1990s.

Comparative studies still suggest that the need for water remains limited in the United States compared with such current areas of scarcity as the Middle East and China. Over the next decades, the growth of urban regions and the depletion of existing resources are likely to generate growing scarcity in the Southwest that will place a strain on current systems of water provision. Current projections, however, indicate that only a limited region from southern California to Texas will face water scarcity on the order projected throughout most of China, south and southeast Asia, the Middle East and Africa.² Other regions, such as the rest of the West and the Northeast states, may face water stresses or other concerns. But the acutest shortages within the United States are likely to be confined to particular states or urban regions rather than extend nationwide.

¹ National Research Council, *Review of the Desalination and Water Purification Technology Roadmap*, Washington, National Academies Press, 2004.

² *Ibidem*, p. 10.

Alongside this intensified local need, the growing cost effectiveness of new desalination technologies has brought new attention to this area in the United States. Although experiments continue with a number of other technologies, reverse osmosis has increasingly emerged as the predominant method for desalination. The cost of this technology has declined steadily in recent years, from \$2000/acre foot (or \$1.65/litre-m³) in 1990 to \$800/acre-foot (or \$.65//litre-m³) in 2003. Much of this drop has followed from increasingly economies of scale, as the size of plants has grown. This cost remains roughly twice as expensive as conventional water in the Los Angeles region. But the expectation of eventual higher prices due to shortages, the growth of public subsidies for desalination plants, and the prospect of even greater savings due to still larger plants, has begun to transform the market. Plans are now afoot for a number of plants, particularly along the California coast, that will represent a major step toward reliance on desalination for significant portions of the water supply.

III. DESALINATION AND THE CONTEXT OF U.S. WATER PROVISION

To understand how this prospect is likely to play how, and how developments in the United States can be analyzed for comparative lessons for developing countries like Mexico, requires some background information on the institutional and regulatory context of the U.S. unlike in Mexico, the structure of regulation and even much of provision in the U.S. is highly localized. Where state and federal governments are involved, a high level of institutional complexity often still leaves local governments and residents with an important role in decision-making. Partly for this reason, the regulatory culture of the U.S. also offers ample reinforcements to regulatory norms.

Although U.S. federalism vests decisive power over local governments at the state level under the constitution, it is at the level of localities and sub-state regions that most provision of infrastructure like water and electricity gets decided. Publicly owned local utilities are one way that this occurs, as these firms often negotiate contracts for supply with private companies and surrounding utilities. Water provision in particular often takes place through specialized governmental authorities that

serve groups of communities in a regional district. Public-private partnerships often allow a strong role for private companies in these arrangements. Private utilities, for instance, supply one-fifth of California's drinking water.

Water in particular has emerged as a growth industry in recent years. With the prospect of global water shortages as well as growing need in the southwestern U.S. and the potential for market stresses in other U.S. regions, a market of some \$150 billion has been forecast for equipment, filtration and water provision by 2010. U.S.-based multinationals have seized on this opportunity.³ General Electric, for example, recently acquired four smaller companies involved in water filtration and water supply.

The legal and institutional structure of the United States has assured that states and localities have borne the main burden of regulation and decisionmaking on desalination. Federal constitutional provisions have remained almost entirely in the background. Federal allocation of authorities to the states and of regulatory authorities to national and state levels, and constitutional provision of rights to private property, are generally taken for granted in debates about water and electricity policy. The most important federal influences may be found in an array of federal legislation that has set the terms for regulation of air pollution, water pollution, and more general environmental impacts of governmental decision-making. A variety of federal authorities participate in carrying out this legislation. Although much of the authority in environmental matters rests with the Environmental Protection Agency, the Army Corps of Engineers and the Coast Guard also participate. States and localities also bear responsibility for administering even many of these rules, such as water and air pollution legislation.

For local regulatory activities and local public utilities, the states are the main instances engaged in oversight. State legislation establishes and sets the terms of local government institutions and governance. States authorize and specify procedures for local planning, health, and property regulation. States usually oversee special districts concerned with water issues, and the regulation of public and private utilities. States impose Environmental Impact assessments for local decisionmaking just as

³ Deutsch, Claudia, "There's Money in Thirst: Global Demand for Water Attracts Companies Big and Small", *New York Times*, 10 de agosto de 2006, p. C1.

the federal government requires these in federal decisions. All states have at the same time assumed responsibility for establishing permitting systems for air and water pollution. In some states, such as California, the requirements that states impose in coastal areas can influence the prospects and character of desalination processes even more decisively.

Finally, there is decision making at the local level itself. Experience so far suggests that the local politics of desalination is often the most decisive for approval of desalination even when the processes take place at higher-levels. Local governments have primary responsibility for decisions about local land use and zoning. Often they exercise at least partial control over the supply of water and electricity as well. In addition, most states authorize local governments to engage in general regulation of matters concerning local health and welfare.

Increasingly, water policy in areas that face growing stresses in water provision has emerged from complex negotiations among governments at all these levels. In California and Arizona, for instance, the U.S. Department of the Interior, the state governments and the metropolitan water districts of various cities and regions have negotiated settlements of how water from the Colorado River has been allocated. Even in this circumstance, tight coordination among different levels of government has been rare. Companies or local governments seeking to develop a new desalination plant in a community are themselves responsible for pursuing the multiple, overlapping permits that are typically necessary. In California, up to twenty-four separate permits from an array of agencies at multiple levels of government may ultimately be required (Table 1).

Table 1
*Regulatory Permits That May be Required for a Desalination
Plant: The Example of California*

<i>Level of Government</i>	<i>Permits</i>
Federal	Clean Water Act, Rivers and Harbors Act, National Environmental Policy Act (Environmental Impact Assessment), Coast Guard (vessels, traffic safety, navigation), National Marine Fisheries Service

State	Coastal Development Permit, Amended Domestic Water Permit, Source Water Assessment and Protection Permit, NPDES or Waste Discharge permit and Water Quality Certification (under federal Clean Water Act, for discharges), State Lands Commission permit, California Environmental Quality Act review (Environmental Impact Assessment), Department of Transportation Coastal Development permit, Department of Transportation Encroachment permit, South Coast Air Quality Management District permit (under federal Clean Air Act), Energy Commission, Public Utilities Commission, Historic Preservation Office compliance
Local	<i>County</i> : approval of offshore and beach structures on state tidelands granted to county, County Department of Environmental Health compliance <i>City</i> : discretionary land use/zoning permits (i.e. use permit, flood plain overlay zone permit, etc.)

Source: California Coastal Commission, *Seawater Desalination and the California Coastal Act*, appendix C. www.coastal.ca.gov/energy/14a-3-2004-desalination.pdf, 2004.

Much of the engineering expertise expended on a project under these circumstances goes into filling out permit applications. The complexity of the regulatory system and its administration also help to explain why lawyers have come to play such a prominent role in the development process surrounding such plants in the United States.

IV. FEDERAL AND STATE INITIATIVES TO PROMOTE DESALINATION

Against this regulatory background, governments at all levels in the United States have also undertaken initiatives to foster the growing market for desalination. Federal legislative initiatives go back decades, and have recently been revived. More recent initiatives in a handful of states are largely responsible for creating the market environment that has prompted growing private investment in new projects. Much of these more recent initiatives grow out of advocacy in the limited but sizeable regions of the Southern and Western coastal areas where limits to the water supply have increasingly run up against expectations of significant population growth.

1. *Federal initiatives*

The federal government has a longstanding pattern of support for desalination, but mainly through support for research and technology development. In the post-World War Two era, the Saline Water Conversion Act of 1952 established an Office of Saline Water at the federal level, later designated the Office of Water Resources and Technology. Allocations channeled through this office distributed over \$1.4 billion on research into desalination technologies over 1955-1982, including path-breaking research that helped establish the commercial potential for reverse osmosis technology. The subsidies and the Office were abolished in the federal budget cuts under President Reagan in the 1980s.

In the 1990s under the Clinton Administration, new water shortages prompted renewed Congressional support for desalination efforts. The Water Desalination Act of 1996 led to \$14 million in appropriations for support of research and technology development over 1996-2003. To lobby for additional support, a coalition of water districts from the states of California, Texas and Florida, where desalination has mostly centered in the United States, formed the U.S. Desalination Coalition in the early 2000s. The group continues to lobby for additional federal legislation that would provide financial incentives in support of desalination for both brackish water and seawater.

2. *State and Local Initiatives*

Most recently, as in U.S. policy toward renewable energy sources and a number of other environmental issues, state governments have taken over from the federal government in promotion of desalination. State-level initiatives have catalyzed the development of plans for new desalination plants in Arizona, California, Florida and Texas. In addition to funding subsidies that have sometimes surpassed those available at the federal level for pilot or model projects, state initiatives have made recommendations for local policies and have sought to sort through the maze of regulatory requirements so as to prioritize new desalination initiatives. State task forces have also brought new attention among local governments, businesses and the public to the potential need for desalination. New local efforts to build desalination plants in California and Texas owe partly to these state initiatives.

3. *The Example of California*

During a period of droughts in the late 1980s several California communities had initiated plans for desalination plants. Although most such plans were abandoned, another wave of initiatives came in the 1990s as the cost of reverse osmosis as a process for desalination fell. In 2002, with the passage of Proposition 50 by statewide popular referendum, the state established a program that awards \$25 million annually in grants for desalination projects. That same year, the State Legislature established a Desalination Task Force that investigated the prospects for desalination and the regulatory frameworks related to it over 2002-2003. The Task force had only advisory powers itself, but successfully argued that the state should give support to desalination as a matter of policy.⁴ It also recommended environmental and procedural guidelines for local governments to use in sorting through the maze of regulations and other policies relevant to desalination projects. In the Los Angeles area, the Metropolitan Water District serving most of the metropolitan region has also introduced subsidies for local water agencies to fund desalination initiatives.

The result of these supportive initiatives, along with the evolution of market conditions, has been a remarkable surge of new desalination project plans across the more arid southern part of the state. Already, eleven seawater and forty groundwater projects are in place. Most of these existing projects have been smaller in scale, and most have served industrial uses. But as private companies have become increasingly active, plans have emerged for at least twenty-one new seawater and thirty brackish groundwater projects. Most of these new plans, particularly in Los Angeles, Monterey, Huntington Beach and Carlsbad, would serve municipal customers as well as industries. Several are projected to operate on a larger scale than existing plants, ranging up to 50 million gallons a day (189 000 m³/d) for the Huntington Beach and 20 million for the Carlsbad facilities.

4. *The Example of Texas*

In the state of Texas too, the prospect of burgeoning population growth and impending water shortages have brought desalination onto

⁴ California Department of Water Resources, *Water Desalination – Findings and Recommendations*, Sacramento, Department of Water Resources, 2003.

the state policy agenda. In 2002, Governor Rick Perry called for construction of the first large-scale desalination plant in the state. Acting partly on his request, the legislature authorized a feasibility study to examine how the state could support moves toward desalination. The study identified three sites for demonstration projects to be encouraged through state subsidies. In 2004, the Texas Legislature voted to allocate \$3.3 million for a pilot study for a seawater desalination plant at Brownsville on the coast of the Gulf of Mexico near the border, for two demonstration brackish groundwater desalination projects, and for outreach.⁵

These initiatives, along with the market for new desalination projects, have remained more modest in Texas than in California. The lack of environmental regulations like the zoning and coastal protections of California does result in fewer obstacles to the introduction of desalination in Texas. However, public financial support has proven more limited, and the market has so far attracted fewer investors.

V. AN EXAMPLE OF THE ISSUES SURROUNDING LARGE-SCALE MUNICIPAL DESALINATION: THE HUNTINGTON BEACH (CA) PROJECT

The ongoing saga of the Poseidon Project proposed for Huntington Beach in California offers instructive insights into the way that large-scale desalination projects are likely to play out in the United States. Proposed and advocated through an alliance of private investors and local public bodies, the project is currently winding its way through the thicket of permitting procedures and approvals. Controversy over the project at the local level demonstrates how these processes have brought a range of environmental and political concerns characteristic of large desalination projects to the fore. Although it remains too early to say how much the controversy may alter plans for the new facility, it demonstrates the considerable opportunity the U.S. regulatory context offers to contest the environmental and other consequences of public-private arrangements for desalination.

⁵ Texas Water Development Board, *The Future of Desalination in Texas: Volume I*. Austin, Texas, Texas Water Development Board, 2004; Mullican, Bill, *Texas Water Development Board Update on Desalination Activities*, (powerpoint presentation), Austin, Texas Water Development Board, 2006.

The proposed Phoenix plant would be the largest in the U.S., and would use reverse osmosis procedures. The Poseidon Resources Corporation, which proposed the project, was founded by a small group of investors on the U.S. east coast with expertise in water and desalination technologies. Poseidon had already built a project in Tampa in 2000. That project was ultimately bought out by the local government following bankruptcies by two subcontractor firms, and the controversy arising out of it presented one of the main stumbling blocks in the process of approvals for the Huntington Beach plant. Around the same time the company proposed the Huntington Beach plant, it also made arrangements for a project of similar size in Carlsbad in Orange County. Although Poseidon itself was not international, opponents of the project saw the prospect of connections to a large multinational company.

The location of the project, the town of Huntington Beach in Orange County, California, is a wealthy, mostly white suburb of Los Angeles with a population of 190 000 and an average property values well above the median for the metropolitan area. Plans for the project called for public-private arrangements that would have limited the need for new mitigation measures and capitalized on existing power generation. The new project would share intake and discharge with the existing Huntington Beach Power Generation Station run by the local public utility. Poseidon also committed to sell half of the desalinated water produced by the plant to the local water district. The remainder of the water would be transmitted to other towns.

The process of approvals for this project is still ongoing, but has been more conflictual than for the other plants under consideration, including the plant of similar size that Poseidon has proposed in Carlsbad up the California coast. City Council proceedings to approve discretionary permits presented the first obstacle. The Council initially sent the proposal back for a second environmental review.⁶ Subsequently, early in 2006, it narrowly approved a modified version. Although now approved at the local level, the project is now awaiting completion of the permitting process at the state level. The Coastal Commission has already expressed doubts about the effects of the proposed plant. Throughout the process, opposition

⁶ City of Huntington Beach, Seawater Desalination Facility. Webpage retrieved, 28 de septiembre de 2006, <http://www.surfcity-hb.org/citydepartments/planning/major/poseidon.cfm>

to the project has proven stiff. Prominent coastal protection advocates as well as other environmentalists have spoken out against the project. In addition to local council members, the Mayor of Huntington Beach himself has spoken out against the project. The opposition that has crystallized resembles the kind of resistance that opposed new development and infrastructure measures in affluent communities around Los Angeles.⁷

The arguments over Poseidon suggest the nature of ongoing debates about desalination in the United States. Two main sorts of objections have driven opponents of the project. Perhaps the most vocal, raised by environmentalists and the Coastal Commission, points to potential environmental hazards. Environmentalists contend that the brine discharge from the plant poses a danger to marine life, and the intake facility might also endanger fish.⁸ A further objection raised questions about whether a public resource like seawater should be sold for private profit to the highest bidder. Others raised questions whether the entry of multinational firms into a role in the project might ultimately establish the basis for legal challenges to local regulation on behalf of the community and the local environment under international law. The North American Free Trade Agreement, for instance, might be invoked to argue that local efforts to set the terms for distribution of water from the plant interfered with contractual rights. Even if this argument could be questioned on a legal basis, it carried considerable political weight in the local arguments.

Other opponents focused their objections more on the nature of the public-private partnership and the interests of the local community in benefits from the plant. Council members pointed to the troubled plant that Poseidon had also constructed in Tampa, Florida as an example of how the mostly privatized scheme for water supply could lead to mismanagement, neglecting longer term objectives in favor of short-term modifications. The plans to distribute much of the water outside of Huntington Beach also raised the ire of some residents, who contended that local water as a precious resource should not be distributed outside the community.

⁷ e.g. Davis, Mike, *City of Quartz*, Boston, Verso, 1990; Weiher, Gregory, *Fractured Metropolis: Political Fragmentation and Metropolitan Segregation*, Albany, State University of New York Press, 1991.

⁸ Overley, Jeff, "Poseidon's Adventure in Tampa", *Huntington Beach Wave*, 14 de julio de 2005, http://www.hbdesalfacts.org/html/tampa_saga.html; Dixon, Chris, "Desalination: The Solution or a New Problem?", *Surfer Magazine*, 27 de agosto de 2005, <http://www.surfermag.com/features/oneworld/desalination/>

Proponents were ultimately able to carry the day within Huntington Beach. They argued that the long-term contracts that the town had secured with Poseidon assured that the public-private arrangement would secure the public interest. They pointed out the benefits to the public from the assumption of risk by private investors rather than the local government itself. New economic development and the associated jobs offered an additional advantage.

Other projects in the planning stage in the U.S. have generally elicited much less controversy and even less public discussion than the Poseidon project in Huntington Beach. Even with a carefully constructed public-private arrangement and ample financial resources behind the project, the controversy and the issues raised bear a resemblance to the controversial issues that other papers have described in Mexican projects. The process illustrates how the extensive procedural and regulatory requirements that surround desalination offer numerous opportunities for public discussion and debate over the strengths and weaknesses of a desalination project. It is not yet certain that the Poseidon plant will succeed in overcoming the procedural hurdles. Yet the need to meet the numerous requirements and overcome objections has undoubtedly left the proposed project a stronger, more environmentally responsible one.

VI. CONCLUSION: ARE THERE LESSONS FROM THE U.S. EXPERIENCE?

Desalination in the United States stands at the threshold of a breakthrough that is likely to have far-reaching consequences for the many regions of the world where future water needs are likely to prove more extensive and more severe, such as India and China. The new reverse osmosis plants being developed in California will mark the first large-scale community water provision by this means in the United States, and have the potential to pioneer technical and organizational solutions that could provide the foundation for a global market and a real solution to the looming world water crisis. In the United States itself, desalination is forecast to provide no more than 10% of water, but in certain regions will emerge as a major supplement to overcome droughts. Although cost considerations still limit the applicability of emerging desalination technologies, public subsidies in states like California and Texas now offer

the prospect of profitability for firms contemplating investment in the new desalination technologies. It seems likely that the further refinements that are likely to occur will finally bring desalination across the threshold of cost-effectiveness, at least for certain types of communities with the right combination of seawater or brackish water access and need. Indeed, local opposition on environmentalist grounds of the sort that arose in Huntington Beach has remained only scattered. In poorer communities like Long Beach (California) or Brownsville (Texas), there has been no sign of regulatory challenges to plans for desalination. Even the critical issue of energy use for desalination has rarely been framed as a greenhouse gas issue the way it has in Mexico or even in other areas of U.S. environmental policy discussion. Instead, the energy problem has been framed mostly as a matter of added cost.

Despite the much more centralized context of policymaking toward desalination in Mexico and other developing countries, and the greater limits on resources to invest in these technologies, substantial lessons can be drawn from this ongoing story. First, it appears likely that even before the cost of desalination has fallen to make it marketable by itself, it can be made widely cost-effective with a combination of private investment and public subsidy. Despite rising costs for the necessary energy, growing technical efficiencies are likely to continue to chip away at the costs and energy requirements for desalination.

More far reaching are the implications for the ways that any kind of system for public or private provision of water through desalination should be organized. Private investment may be unavoidable above all for desalination to be carried out in developing countries, as it is unclear how else adequate investment can be generated to make the more efficient larger scale reverse osmosis projects feasible. To make privatized arrangements accountable, however, protections through regulation at multiple levels, including local review, are critical. The presence of mechanisms for local accountability like those at work in Huntington Beach is a significant virtue of the U.S. regulatory system.

As the case of Huntington Beach also suggests, the localized, fragmented process that has helped provide for this accountability in the United States also has major disadvantages. The localized nature of most regulation means that little attention is given to equity among places. Not only was this issue almost entirely missing from debates at Huntington Beach, but the opposition centered partly on objections that the water

might be distributed beyond the limits of this wealthy town itself. Moreover, it is only in the most privileged communities like Huntington Beach that the U.S. regulatory process has given rise to challenges that have forced more attention to environmental concerns.

The problems of fragmented governance extend beyond this question of social and environmental equity to issues of overall efficiency. The implantation of desalination plants in the United States has largely followed the patterns of public investment, gravitating toward the most subsidized state of California. But beyond this tendency, however, public planning or more systematic collective decision-making has mostly been missing. The placement of new plants has proceeded according to logics of private investment rather than policy guidance. It is by no means clear that the current placement of plants corresponds to the public need for desalination or even the demand of local consumers. Instead, investors like Poseidon appear to be focusing on communities with greater ability to pay for the investments in plants and infrastructure for desalination technologies.

Finally, the case of Tampa and the debates in Huntington Beach suggest that private investment itself may still be too unreliable by itself to furnish the basis for investment in desalination. State or federal regulation may ultimately be necessary to establish a stable basis for market investments and accountability in desalination projects within the United States. In these respects as well, current developments in the area in the U.S. provide a cautionary tale for other countries.

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