Society, Politics and Desalination

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Introduction

This chapter will discuss how existing conditions affect the decision to increase desalinated water supplies and the resulting social and political impacts of that decision. On the one hand, desalination can strengthen the bonds within or between communities. On the other, it can damage these bonds, weakening relations with local and global neighbors.

Success or failure arrive on two margins. On the intensive margin of relations *within* a community, desalination will be helpful when costs are allocated in proportion to benefits but harmful when they are not. On the extensive margin of relations *between* neighboring communities, desalination will be helpful when shared/ collective goods are augmented or strengthened but harmful if they are weakened.

These themes will be explored by sketching a basic theory of how to manage goods efficiently, outlining the role of political mechanisms in classifying and managing waters as different types of goods, and evaluating the social impacts of allocating the costs and benefits of water. First a framework for discussing "good" (fair, efficient, sustainable) water management will be formed by clarifying where political decisions create the rights and responsibilities that social groups must claim or bear. Once this framework is in place, we will consider whether technology can be "innocent" of its impacts before exploring a few case studies in which desalination brings a mix of helpful and harmful social, political and economic impacts. The chapter concludes with some principles for "no regrets" desalination.

Separating and mixing water

The properties of water *as a good* depend on local conditions. Scarce water may be rival in consumption, as when one person's use reduces the supply for others to use. Water can also be open access if it is difficult to restrain others from using it. These two characteristics (rivalry and excludability) can be combined in four ways when it comes to describing what "type" of good water resembles; see Table 1.

Table 1: A good should be managed according to its nature (rival goods are consumed in use) and accessibility (people can be prevented from using excludable goods).

	Excludable	Non-Excludable
Rival	Private Good	Common-pool Good
Non-Rival	Club Good	Public Good

Source: Zetland (2011)

The key insight is that the type of good can change with local conditions. It is possible to turn a public good — a lake, for example, whose waters are non-rival and non-excludable —into a common-pool good after farmers start to divert its waters to their fields, thereby introducing rivalry with those who want to swim. That same lake can then be converted into a club good (or toll good) by the creation of a “lake users' association” whose few members use the lake without crowding its surface or depleting its waters.

What about private lakes? Yes, they can be drained (rival), but the costs and benefits of such actions fall squarely on the owner, not others (excludable). A different outcome — of damages to outsiders from a reduction in lake discharges, disruption of local ecosystems or even aesthetic destruction — would mean that the lake was not really a private good (ownership is not important here) but rather a common-pool good. A good's type does not depend on ownership or what people call it, but how it is managed and how those management decisions affect others. This difference explains how a common-pool *situation* may — or may not — turn into a common-pool *dilemma* (Ostrom et al., 1994; pp. 15-16).

Thus, we can define water as a "collective" or "separate" good, according to excludability. Collective waters are common-pool or public waters shared among whichever groups use them. Separate waters are private or club waters whose use is reserved for a particular group.

Turning from goods to groups, we will define a “social group” as a self-identified set of people, voluntarily assembled. A “political group,” in contrast, is defined by some outside criterion, like a national or urban boundary. Individuals belong to groups in different ways. Someone can be administratively assigned to several nested political groups (e.g., city, region and nation) at the same time as they voluntarily affiliate with embedded or overlapping social groups (e.g., a local parent but global environmentalist).

The peer-to-peer versus top-down difference between social and political groups is magnified by water's physical nature. Social groups might form around shared interests in drinking water, environmental flows, aquifers and so on. The definition of political groups, in contrast, often ignores standing or flowing waters.

These differences say less about the quality of water management than what techniques might be used or abused. Among neighbors in communities, there are informal and social institutions for directing water (Williamson, 2000). Between neighboring communities, there are formal legal and political institutions for dividing water quantities and maintaining water qualities (Wolf, 1997). These existing institutions will play a big role in outcomes. Social groups that constrain rivalry will preserve their common-pool goods. Those that fail will experience a common-pool dilemma that destroys the good, i.e., a “tragedy of the commons” (Ostrom, 1965; Hardin, 1968; Lansing, 1991; Ostrom et al., 1994). Political groups, likewise, can create useful exclusionary rules that protect resources, but they can also be manipulated into delivering goods to special interests at the expense of the majority (Olson, 1965; Shepsle and Weingast, 1984). Desalination can change the status quo, but the direction of change will depend on how groups integrate it with existing political and social institutions. The next section will focus on political groups and how they separate waters for their exclusive management; the following section will look within these social groups to examine how they manage collective waters.

Political groups and separate waters

Start with a simple example of a river that crosses from one political jurisdiction into another. At some point this river might have been a public good for both places, in the sense that neither side could stop the other from diverting, using or polluting the river, but those consumptive actions were not relevant relative to the river's much larger volume. The river (as a public good) was "not worth" managing because everyone could use as much of it as they wanted.

Such a situation usually ends when one or both neighbors affect the quantity or quality of water in a way that is detrimental to the other, thereby introducing rivalry that turns the river into a common-pool good. This moment is usually noticed by some groups before others in each jurisdiction. Fisherfolk and drinking water operators are closer to the river than politicians or citizens who indirectly interact with it.

The next step depends upon (and eventually affects) the relations between neighbors. If they are in constant contact and cooperating across multiple issues ("close"), then we can assume that the emergent water issue will get speedy attention. If they are hostile to each other or preoccupied with other concerns ("distant"), then we may see the issue deteriorating off the agenda.

These two scenarios — close and distant neighbors — help explain success or failure in addressing water issues. Close neighbors with multiple ongoing discussions will find it easy to put water on the agenda and make a quick agreement on how to reduce frictions and harms. Distant neighbors with weak links and perhaps hostile relations will find it difficult to discuss water when other issues are more important to political leaders and the public prefers to blame neighbors for water woes (Zetland, 2008).

In economic terms, we can say that the transaction costs for addressing problems in managing water as a common-pool (or collective) good are low and high for close and distant neighbors, respectively. Low transactions costs mean that close neighbors can find a way to "exclude" their impacts from each other — by limiting diversions or pollution, for example — such that they share common waters without problems. High transactions costs make it harder for distant neighbors to cooperate on protecting the collective waters they share.

The addition of desalination in these conditions can strengthen or weaken relations among neighbors. On the one hand, desalination can make it easier to share with a neighbor, thereby building trustful relations. On the other, it might replace interdependence with independence, thereby making it easier to neglect cooperation. The direction of impact (helpful or harmful) depends more on political intent than baseline cooperation, but momentum makes it more likely that desalination will make a good situation better of a bad situation worse.

Desalination might therefore strengthen cooperation, efficiency, resiliency and equity between neighbors that share its costs and benefits within a portfolio of waters. By the same logic, desalination might also weaken cooperation, efficiency, resiliency and equity as neighbors fight over the impacts of its costs and benefits on their portfolios and security. Desalination might, for example, make it easier to cooperate in recycling a neighbor's wastewater or anger neighbors affected by the plant's pollutants.

Put differently, desalination technology can expand the space for action, but the impact of that expansion depends on how the space is being used by the desalinating party and neighboring parties. An example from the workhorse of cooperation games — the Prisoner's Dilemma (PD) — will illustrate this point.

In the PD's most common set up, two players do not cooperate because each — fearing the other's betrayal — betrays "first" — leaving both worse off than if they had been cooperating. This (lose, lose) result depends on caveats about information, communication, and the game's "one shot" nature. It does not pay to cooperate because there is no way to build trust. Few human interactions fall into the PD paradigm, but the idea is useful for explaining how different groups might be unable to build a mutually agreeable relationship. The result of a repeated-PD, on the other hand, is often more cooperation for mutual benefit (Axelrod and Hamilton, 1981). Why do we see more cooperation in repeated PD games? The returns to continuing cooperation are much greater than the returns to isolation and strife (Smith, 1776).

These two structures — one-shot and repeated — give us a shorthand for desalination's impact on collective waters and political relations. If neighbors are "playing one-shot," then desalination will either prolong that strategy (by increasing private water) thereby reducing cooperation, or it will make it easier to change strategies. Morrissette and Borer (2004, 87) miss these points when they claim "many future conflicts throughout the [Middle East and North Africa] will be directly linked to" water scarcity because they forget to consider desalination as a tool.

Desalination can cause a switch to "repeated game" if it reduces risk and thereby makes it easier to change positions from "maximize own share" to "cooperate to perpetuate the resource." The same logic might explain a symmetric switch — this time from repeated to one-shot play — if one or both players decide that desalination gives them less reason to cooperate. It is more likely, of course, that desalination will strengthen existing relations among cooperators. One player might build a desalination plant that the other player pays to use or complements with their own reforms on water supply and use.

This section explains how desalination's impact of relations between political neighbors will depend on whether they are already cooperating or not. In most cases, desalination will strengthen that relationship — or lack thereof — but it can also initiate a shift from lower to higher cooperation (or vice versa). The exact move will depend on how each side perceives the other's regard for their separate and collective waters.

Social groups and collective costs and benefits

Each political group contains different social groups that exist within or among political entities. These social groups have informal links and powers that may exceed or fall short of formal political powers. Political decisions over the allocation of benefits and costs from infrastructure projects often affect different social groups differently (Flyvbjerg et al., 2003). Uneven allocations tend to encourage wasteful projects because they allow agents in a principal-agent relationship to allocate benefits to special interests (including themselves) at the expense of their principals (Olson, 1965; Gottlieb and FitzSimmons, 1991; Hall, 2000).

Thus, it is possible to see how politicians might ignore a social group opposed to desalination for environmental reasons in favor of a pro-desalination, business-as-usual lobby. Even more typical is the case where desalination costs are blended with other costs to determine an average cost water price ("postage stamp pricing," or PSP) that burdens existing customers with the cost of a new desalination project that will serve new customers (Zetland, 2008, 2014). These structural features, along with desalination's high cost relative to naturally occurring freshwater sources (Gleick, 2003), explain why desalination projects are often controversial, but they are insufficient to rule out desalination as a tool for addressing water scarcity. On the one hand, it may make sense to charge its putative beneficiaries the full cost of their new water. On the other, there may be a social consensus that those charges should be split among all. These opposing reasons do not recommend sticking with the status quo of PSP, however, as few water customers actually realize they are enrolled in a PSP system. Stepping back, one might ask whether desalination is cost-effective for addressing various water problems. Is there, perhaps, not a community solution involving trade-offs that might work better than a desalination solution (Ciriacy-Wantrup, 1944; Wahl and Davis, 1986)? In some cases, this question is not really asked, as water managers might prefer a technical solution over the burden of a dialogue with busy citizens who may not care too much about water management (Zetland, 2013).

The political section above describes the impact of costs and benefits on relationships affecting separate and collective goods. This section did the same for social groups. The difference is that the political calculus *within* a jurisdiction has to take far more care around interest groups than when acting in relation (or against) another jurisdiction. As a simple example, consider the debate over a division of water rights within a country versus the debate over how much to "give" to a downstream country.

Society, politics and technology

Most of the last section focused on the magnitude and distribution of desalination's costs and benefits among different social (or interest) groups. The claim of this chapter is that the greater the mismatch between costs and benefits on various groups, the larger the likelihood of inefficient (and unjust) desalination.

Technology enters into this discussion as a modifier of costs and benefits — monetary or not. More efficient reverse-osmosis membranes, for example, lower energy use. A reduction in energy use *also* means lower greenhouse gas emissions if power is supplied via fossil-fuel driven sources. Better technology can also increase benefits. Some companies such as Memsys Inc. makes membranes that desalinate using waste heat. Such membranes increase motor efficiency by drawing off heat. The net result — given high fuel costs — is that the membranes desalinate water at a "negative cost" because savings from lower fuel consumption are larger than the desalination unit's capital costs (Aquiva Foundation 2016).

These examples do not mean that technology always offers the best answer to a problem, nor that technology can scale to address larger problems such as poor water management (Schenkeveld et al., 2004). Desalination is an expensive source of supply and not necessarily the only option for addressing water scarcity. On the demand side, wasteful water use can be reduced by increasing water prices to the full cost of service, i.e., operating plus capital and risk-related costs. An increase in prices can reduce consumption by enough to eliminate scarcity — especially if it is accompanied by conservation publicity (Loaiciga and Renehan, 1997). In some cases, awareness alone can reduce demand by enough to eliminate the need for desalinated supplies — as happened recently in San Diego (Rivard, 2015). Higher prices and conservation messages need to be salient and actionable if they are to impact customer behavior (Kahnemann, 2011).

Desalination can also be useful as a cash solution to a bigger, non-cash problem. Local desalination can eliminate the need to defend a distant natural water source. It can replace environmentally-sensitive water sources that can be left to resume their natural flows. In some cases, desalination can even secure food production from the vagaries of market prices or unreliable irrigation, but those cases are not as common as examples where desalinated boondoggles merely subsidize farmers. Technology can help or hinder social and political relations, so desalination must be deployed with care.

Examples of harmful and helpful desalination

The proceeding discussion might leave readers without a clear definition of the social and political impacts of desalination. This generality is intentional, as the existing institutional environment determines whether is useful. This section's examples will explore how impacts vary with deeper social and political forces. Desalination is neither necessary nor sufficient for good water management.

Israel and Singapore

Israel and Singapore have managed water from a national security perspective since the Israel's independence in 1948 and Singapore's in 1965. Both countries had limited domestic supplies and less-than-brotherly relations with neighbors – facts that deeply affected their views on desalination.

In Israel's case, insecurity was lessened after the 1967 Six Day War in which Israel captured the West Bank (and thus the Jordan River) from Jordan and the Golan Heights (and thus the Sea of Galilee, or Kinneret) from Syria. These territorial gains, combined with Israel's power to veto any water-related projects by Palestinians in the Occupied West Bank, *might* have placed Israel in a position of water security except for the power of Israel's agricultural lobby (Kislev, 2001; Schwarz, 2004).

In fact, it is not hard to see expanding irrigation demand as one of the *causal* factors behind the Six Day War, as anxious neighbors watched Israel's irrigation network expand towards their territories and waters (Tal, 2006). Indeed, pre-war agricultural consumption of around 1,000 MCM (million cubic meters) has not dropped below 1,200 MCM since 1967 (Schwarz, 2004). Many casual observers of Israel's "water productivity miracle" might be confused by this statistic on total use due to their familiarity with falling irrigation *per capita*, but — as Kislev (2001) explains — that drop is misleading. First, it reflects population increases. Second, agricultural policy does not target food security: Israel imports over half its food and exports a sizable share of its domestic production (Kislev, 2001).

Others have argued that irrigation water is worth too little to block peace (Beaumont, 1994; Fisher et al., 2005) or that farmers can cut back on their demand if charged higher prices (i.e., elasticities of -0.30–0.46), but these "net benefit" arguments are trumped by political calculation (Bar-Shira et al., 2006). As Stukki (2005) points out, Israel's mid-1990s agreements with Jordan and the Palestinian government did not reduce Israeli supplies as much as promise new supplies to the others. Those agreements explain why increases in water recycling (since the 1950s) and desalination (since the 2000s) have neither reduced aquifer overdrafting and pollution, nor slowed the 1.2 m per year drop in Dead Sea levels (Tal, 2006). These signs of increasing domestic scarcity are not driven by inelastic urban demand, but agricultural and nationalist lobbies that see existing and additional water supplies as their property (Kislev, 2001).

Tal (2006) calls for new supplies to support peace and environmental restoration, but neither goal may be met. Cities on 100 percent desalinated water have probably abandoned natural sources to farmers. The Red-Dead desalination project promises to add water to the Dead Sea and increase supplies to Jordan *without* reducing Israeli supplies, but the World Bank-subsidized project will not improve water conditions for Palestinians (Al-Khalidi, 2015; Melhem, 2015). Israeli desalination has done nothing to reduce the agricultural demand that imperils neighbors and ecosystems. According to OECD (2015), irrigation consumes 57 percent of Israel's water and agricultural consumption takes priority over environmental flows.

Israel has used desalination to divide its domestic, common-pool water into separate private goods allocated to cities or farmers. The end of domestic debate over agricultural water policies has made it harder for neighbors, e.g., worsening relations with Palestinians over common-pool groundwater in a manner similar to that seen over surface wastewater flows (Fischhendler et al., 2011). Relations have perhaps improved with Jordan over the common-pool Jordan River, but this has only occurred with the aid of subsidies from the World Bank that made it possible to add private water that would not threaten Israeli irrigation. Desalination is not going to improve water management in the region until deeper social and political changes occur.*

The contrast between Israel and Singapore is stark for political and social reasons, not for technological or cost-benefit reasons. In the case of Israel, the division and management of common-pool water is poorly defined with respect to Palestinian and Jordanian neighbors. Singapore, in contrast, has access to a legally defined quantity of water from the Malaysian "mainland" until 2061 (Tortajada, 2006). This sole source of regional water leaves the city state of Singapore in charge of finding the rest of its supply domestically, turning the focus from transnational relations to the domestic distribution of costs and benefits. That distribution is fair and efficient for domestic users (there are no farmers) who all pay the same, full cost price for water because it treats desalination as a means of improving portfolio reliability (Tortajada, 2006). Although exact capacities and shares of Singapore's supply sources are not public, PUB (2013) reports that desalination and recycling ("NEWater") will provide 80 percent of its water — the rest will come from rainfall capture — when Malay deliveries end in 2061. This example shows how desalination can be efficient, fair and timely. It also shows how "good fences make good neighbors" by removing a possible obstacle for cooperation with a neighbor with whom relations are sometimes strained.

San Diego and Monterey

For examples related to domestic use (rather than international sharing), let us look at desalination projects in California where, despite political unity, we must still consider political issues related to formal claims on the commons and social issues of how to divide costs and benefits. In San Diego, for example, problems arise over access to imported water from the regional water supplier (The Metropolitan Water District of Southern California, or Met) and testy relations with local environmentalists over the costs and benefits of desalination.

San Diego is willing to pay $900 million for a plant because it does not consider imported water to be fairly priced or reliably supplied, and managers see desalination as a private source of water that will reduce their reliance on Met's common-pool supplies (Zetland, 2008, forthcoming). The decision to desalinate is not without controversy because social interest groups have different perspectives on the relative costs and benefits of the project. On the one hand, you have a pro-growth group that sees desalination as necessary for planned urban expansion (RWMG, 2013). On the other, you have environmental groups worried about local and global impacts of growth and fiscal

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* Editor's note: Israel's blatant human rights violations and transgressions are not within the scope of this book. For more information, refer to '*Amnesty International (2009), Troubled Waters - Palestinians Denied Fair Access to Water*' which states: "The inequality in access to water between Israelis and Palestinians is striking… the amount of water available to Palestinians is restricted to a level which does not meet their needs… Israeli settlers [who live in the West Bank in violation of international law] face no such challenges - as indicated by their intensive-irrigation farms, lush gardens and swimming pools… Israel has over-exploited Palestinian water resources, neglected the water and sanitation infrastructure in the OPT [Occupied Palestinian Territories], and used the OPT as a dumping ground for its waste." (pages 3-4).

conservatives upset that politicians are paying for growth that benefits land developers by charging existing residents (Larson, 2013; Keatts, 2013; Yerardi, 2014; Jennewein, 2015).

Free desalination would allow San Diego to walk away from Met, but costly desalination means the two sides must continue to wrestle over the division of Met's common pools of costs and waters (Zetland, 2008). Turning to local relations, the focus of private benefits and diffusion of social costs means that desalination neither drives efficiency in water use nor contributes to equity in water management (Zetland, 2012). Indeed, the harshest irony is that conservation efforts during California's recent drought have reduced demand by enough to make the plant's supply superfluous to the region's *current* population (residents still use a whopping 150 gallons, or 570 liters, per capita per day) (SDCWA, 2015; Rivard, 2015). Further development is likely to spark conflict over the allocation of the desalination plant's costs between existing and arriving residents.

The case in the Monterey region of California is different in all respects. CalAm, the water provider in the region, depends on the Caramel River and local precipitation for most of its water, but the State Water Resources Control Board ruled in 2009 that most of these diversions were unlawful (Mueller, 2015). This political action re-defined the river's common-pool flows into a private share for CalAm and a remaining common-pool share to smaller users and the environment. That action — combined with low consumption (by California standards) of 440 liters per capita per day for municipal *and* industrial uses — triggered CalAm's application to build a desalination plant (Mueller, 2015). In this case, the social discussion of costs and benefits is simplified by the lack of growth in the area and already low consumption. The battle has thus shifted to one between residents willing to pay for desalination to meet 80 percent of the demand and environmentalists (many of them local) who want to see the area do more with less. A decision to build a desalination plant would not solve local problems, but it would make it easier to restore river flows without depopulating the region.

Saudi Arabia and United Arab Emirates

Many people associate desalination with oil-rich Persian Gulf states, but that stereotype ignores some important facts and policy differences. In both the Kingdom of Saudi Arabia (KSA) and the United Arab Emirates (UAE), for example, most water is supplied from fossil (non-renewable) groundwater and used for agriculture and landscaping (Szabo, 2011; GWI, 2014b). In both countries, water prices were subsidized for years, far below the cost of desalinating (20-30 percent of supply) or pumping water from underground (Ouda, 2013; GWI, 2014a). The resulting high water consumption (as well as population growth) was costly to the environment and political relations with neighbors (Economist, 2014).

Although it is easy to claim that desalination is necessary for life in these countries, the technology's impacts vary with social-political circumstances. In the KSA, cheap water was often seen as an entitlement worthy of subsidizing with oil revenues. In the UAE, citizens and residents in a diversified economy put higher value on sustainability, fiscal prudence and reliable water (the KSA has frequent service interruptions). Abu Dhabi, the wealthiest of the UAE's sheikdoms (and the only one with significant remaining oil reserves) plans to stabilize groundwater levels, reduce water consumption (via higher prices), and reduce the drain on government finances (EAD, 2014; Abdul, 2014). The situation in the KSA was more worrying on every margin — vague concerns over groundwater, conservation education and heavy subsidies — but a December 2015 announcement of higher domestic prices for water, energy and gasoline indicates that massive fiscal deficits have forced the KSA's rulers to reconsider subsidies (Al-Saud, 2013; Samad and Bruno, 2013; Al-Otaibi, 2015).

Perhaps more important, however, is that the UAE's policies on water, finance and sustainability are part of a larger social discussion that includes related matters, such as the irrigation that consumes most of the water (EAD, 2014). The lack of policy debates in the KSA — price increases were implemented overnight, without warning — does not mean other water policies make sense. With irrigation, for example, Saudi farmers — like Israeli farmers — are likely to continue with practices that threaten the environment, water reliability, and diplomatic relations.

Desalination without regret

These examples have shown how the social, political and economic impacts of desalination depend a lot less on the technology than the existing institutions for managing political relations with neighbors and distributing costs and benefits within social groups. We have seen how Israeli desalination can worsen complex, vague relations with Palestinian neighbors at the same time as Singapore's desalination further clarifies mutual rights and obligations with Malaysia. In the case of San Diego and Monterey, desalination allows business-as-usual on two different trajectories: San Diego seems destined to trade its "water independence" for reliability-sapping (and community splitting) growth. Monterey's desalination, on the other hand, promises to help ecosystems without increasing growth. In our final pair of examples, Saudi Arabia treats desalinated water and groundwater as separate gifts to interest groups while the United Arab Emirates manages water within the same portfolio.

Several clear principles emerge from this discussion. The first is that desalination cannot fix deeper social, political or economic problems. The second is that desalination is beneficial if it increases collective security within, between and among nations. The third is that desalination is likely to improve water management efficiency if its costs and benefits are transparently allocated to users. Fourth, the costs of desalination must be considered not only within a diversified water portfolio but also in comparison to the benefits of using desalinated water for basic human activities, ecosystem protections, and so on. Finally, we have to remember that desalination – as perhaps the most expensive source of additional supply – should be considered within a range of options for addressing water scarcity and security, many of which are far cheaper and easier to implement.

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