How markets can end persistent intra-organizational conflict

David Zetland

The Metropolitan Water District of Southern California (MET) is the largest water utility in the United States, wholesaling water to about 20 million residents. MET is legally structured as a cooperative among 26 member agencies. This article examines why internal conflict at MET over water pricing and water allocation persists and what may be done to resolve this conflict and improve the efficiency of water delivery and usage.

The Metropolitan Water District of Southern California, MET for short, is the largest water utility in the United States, wholesaling water in urban areas with a population of about 20 million people. MET imports water to southern California via the Colorado River Aqueduct (CRA) and State Water Project (SWP) and sells that water to 26 member agencies that vary in size, function, and wealth. A companion article examines the origin of conflict among MET's member agencies, a counterintuitive phenomenon to find within an organization formally governed as a cooperative.[1] Conflict stems mainly from member agencies' heterogeneity, most easily seen in their varied dependency on MET's water supply. Some members (e.g., the San Diego County Water Authority, SDCWA) are heavily reliant on MET for water; others (e.g., the Los Angeles Department of Water and Power, LADWP) much less so. Diverging characteristics mean that members do not share a common goal for MET, which makes it an inefficient cooperative.[2] Dependent members want MET to increase water supplies and reliability; less-dependent members would prefer that MET concentrate on minimizing costs. MET's complex system of cross-subsidies makes it difficult to deliver services to one group without imposing costs on others. The main vehicle for cross subsidies is MET's use of "postage stamp pricing" (PSP) for its water. PSP sets the same price for everyone and ensures that letters going across town subsidize the cost of letters going across the country. MET's PSPs for water are based on the average cost of delivery and subsidize members that use infrastructure more heavily. Like most water pricing models worldwide, MET's PSP is based on cost, not scarcity, which makes shortages more likely. This article examines the persistence of MET's conflict-ridden, shortage-encouraging institutions for managing water and covering costs and looks at an alternative, market, mechanism that can better allocate water and costs, reduce conflict among MET members, increase sustainability of the entire system, and improve service to MET's ultimate customers—the roughly 20 million residents of southern California.

The persistence of conflict

MET is over 80 year old. Its member agencies have been working together for most of that time, paying for joint projects that are too expensive for any one member but benefit all. And yet, there are problems with decisionmaking within MET and problems with the consequent allocation of water and money. These result in inefficiencies that lower the benefits of belonging to MET. This first section discusses how such inefficiencies may persist. The second section reviews ideas of how to reduce inefficiencies by reforming MET's decisionmaking institutions for water allocation and cost distribution.

Inefficiencies can persist for several reasons. First, they are hard to quantify. Although it may be easy to understand that one member agency may be getting cheaper water with PSP than the cost of delivery, it may be hard to link price to the actual cost of delivering that water. It may just be easier to charge the average cost of delivery. Second, it is even harder to understand or quantify the opportunity cost of water misallocation. Who suffers more from rationing in shortage: The farmer who gets a lower delivery of water for his avocado trees, the householder who loses his lawn, or the business that must cut a production shift for lack of water? It is hard to associate objective cost numbers with each user. It may just be easier to cut everyone's water supply by the same amount. Third, moving water requires coordination through multiple engineered systems that do not always have capacity at the right place and right time. It is much easier to plan for the same delivery each day to each location for the next several months than to switch water from place to place on the whim of efficiency.

Even if these information and operation problems were to be resolved, cultural, psychological, and political barriers to implementing change remain. MET was founded to deliver cheap and abundant water, not to ration expensive water. The natural response to water scarcity is to go get more water: Prices should not rise; they must stay low. Engineering solutions to increase supply or to improve the efficiency of demand (by reducing leaks or replacing inefficient water fixtures) are much easier to understand than using economic or psychological methods to reduce demand. The staff and managers of MET and its member agencies are some of the best in the business—but they are the best engineers, not the best economists.

The psychological barriers are simple, yet formidable: Change is hard, and people prefer to avoid it. It is hard to change brands of breakfast cereal, to switch one's route to work, or move from one city to another. People undertake change when benefits exceed costs, but the customers who benefit from better water management are not the water managers who pay the cost of switching. This mismatch between the parties affected by costs and benefits, combined with the fuzzy magnitude of costs and benefits (even to experts), makes it hard to justify change. In addition, that MET and

its member agencies are monopolies (as is nearly every water provider worldwide) means that there is weak outside pressure to change. Politicians, regulators, activists, and customers may advocate change, but they need to take time to learn about the current situation and alternative paths from people who may not want to reveal that information or even know what needs to be revealed. This problem is much smaller in the world of business, where efficiency means more customers and greater profits. It is also present in politics and bureaucracy but may be weakened by competition between political parties or comparisons of bureaucracies in different jurisdictions, for instance the speed and cost of getting a driver's license at the Department of Motor Vehicles. The water sector is harder to monitor and understand because most of the action takes place "underground," using water that varies in quality from different sources. Perhaps the greatest barrier concerns the relatively tiny amount of money at stake. Most people do not pay attention to 5 percent efficiency losses for a product that costs only US$3 for 750 gallons (about US$1 per 1,000 liters).

Of course, people become more interested when a shortage is declared, but by then it is too late to take speedy action. Water reservoirs may take years to drain, and longer to refill. Infrastructure (dams, pipelines, and treatment plants) take years and hundreds of millions of dollars to plan, build, and put into operation. Few people can monitor this whole process; even fewer know if the process is even justified. Many people are content to trust that water managers will do the right thing; they cannot know if managers are wasting 50 cents on the dollar or making a shortage 25 percent more (or less) likely.

The final barrier to change is political, and it lies at the heart of decisionmaking in any organization with mismatched costs and benefits. MET, as a cooperative of members with different goals, faces mismatches due to the end of abundant water. Most political bodies with cross-subsidies among citizen groups also encounter mismatches. The problem does not arise from the mismatches, but from their growth. Social security in the United States (and other countries with pay-as-you-go pensions) was designed so that current workers would fund current retirees, for example. This system was popular when the retiree-to-worker ratio was low but is less fiscally sustainable now that the volume of retirees and their benefits are outpacing the volume of workers and their contributions. Many people know that this system needs to change, yet others prefer to keep it going because they benefit from it and can veto change. The Tragedy of the Anticommons is a phrase that refers to this veto power, the way that one or more parties can veto change that pose a real or imagined threat to them.[3]

The Tragedy of the Anticommons, blocking majorities, and increasing cost-benefit imbalances all are present at MET. A number of MET's member agencies are doing quite well with their costs and water supplies, and so they do not want change. Others (e.g., LADWP) do not care overmuch about MET inefficiency because they do not suffer from it; they are uninterested in reform that may raise their costs. Still others (e.g., SDCWA) want change that will give them more water at lower prices: One study calculated that SDCWA paid US$69 per acre-foot in the same years in which LADWP paid US$532 per acre-foot (approximately 326,000 gallons or 1.23 megaliters)[4]—but neither subsidies nor abundance are possible any longer. The end of abundance also ended the "something for everyone" paradigm at MET that resulted from building the CRA that brought too much water sold for too little.[5]

The end of abundant water and of subsidies left member agencies with an addiction to cheap water and growth that could no longer be met. Although some efforts were made to reduce demand (by replacing toilets and switching to volumetric prices that rose with use), most member agencies (and MET) continue to price water in such a way that a reduction in use disrupts revenue. That is because most service costs are fixed, reflecting the cost of infrastructure, but most revenues are variable, to encourage water conservation. Managers target break-even points by setting prices such that expected revenues match expected costs for an estimated delivery volume.

For example, one may see a water system where 80 percent of costs are fixed but 80 percent of revenues are variable. Thus, a family with a US$100 water bill is paying US$20 in fixed (monthly service) charges and US$80 in variable (water consumption) charges. At the same time, the water utility's cost of delivering water is US$80 fixed and US$20 variable. If the family cuts water use by half, for instance in response to calls for water conservation, its water bill drops to US$60 (US$20 fixed plus US$40 variable), but the utility's cost of delivering that water only drops to US$90 (US$80 fixed plus US$10 variable). The net loss to the utility is US$30, and water managers ask for price increases. Price increases displease customers, and displeased customers make for unhappy managers. Consequently, managers facing scarcity prefer to get more water instead of cutting demand.

This supply-side emphasis encourages demand to grow on the intensive (per capita) and extensive (service area) margins; it also impedes customers' skills in adjusting demand (or awareness that scarcity can ever be a problem), making shortages more likely. As a result, municipal and industrial water consumption ranges from 383 to 1,239 liters per capita per day (lcd) in MET cities (100 to 325 gallons per capita per day, or gcd), over fifty percent of which goes for outdoor irrigation.[6] This contrasts to 135 lcd (approximately 36 gcd) estimated to be adequate for human health, economic activity, and social development. Australian urban residential consumption varies from 145 to 290 lcd.[7]

Economists say that a group can change policy if a "core" for an alternative policy exists, meaning that enough members of the group will benefit from the change to get the group to adopt a new policy. The existence of heterogeneous dependency ratios and their increasing dispersion due to the mismatch between political votes (assessed value) and economic stakes (water purchases) means that the core at MET is small and shrinking. Policies that may be economically efficient are not enacted for lack of a core.[8] Thus, policies established in the 1930s through 1950s (an era of water abundance) continue to be used, at great cost.

Another problem in pursuing change comes from the distraction of preferential

rights (PRs). Formally, PRs created priority rights to water in the event of a shortage at MET, yet despite increasing scarcity and occasional years of drought they have never been used. Many member agencies believe that PRs should be used now, but members with few PRs can veto their use. Rather than solve the problem of shortage, PRs prevent a solution to shortage. They need to be retired, but in a way that recognizes their value.

A final reason for the persistence of inefficient policies at MET is related to mismatched costs and benefits. Water managers at MET and member agencies are not paid for efficient water use or reliability. They do not get fired for rationing water or creating and administrating shortages. Their political masters respond to shortages with "handle it." One need not favor Wall Street-type performance bonuses and other high-powered incentives to find it useful to give managers some external motivation and reward for good water management. Most managers want to do a good job, but their monopoly power and discretion on how hard to work and what work to pursue means that they may not undertake uncomfortable projects or make sure that water gets to its highest and best use. The losers from these weak incentives are customers who pay too much for water that is unreliable and worry that other customers are wasting precious resources. The natural environment also suffers, because emergency shortages make it easy to ignore rules and regulations that protect ground and surface waters.

Solutions to conflict

Conflict within MET can be traced to the continued use of institutions for allocating abundant water in an era of scarcity. Conflict over goals (cheap water or reliable water?) and policies that preferentially subsidize certain goals over others result from heterogeneous preferences among MET's member agencies within its cooperative framework. There are two ways to solve this problem: First, change MET from a cooperative to a corporation with an independent Board of Directors or, second, change MET's method of allocating water and cost so that member preferences are irrelevant. Although the former solution is possible, it is politically difficult to advance and may create new problems. (MET is a monopoly, after all). Ignoring the first idea, the solution to be discussed—price rationing through auctions—would probably also be pursued by a corporation. Thus, the important idea here concerns the means of allocating water and costs, not the legal structure of the organization. Although governance structure may have an impact on allocation via rules, votes, or other bureaucratic mechanisms, it will not have an impact on an internal auction market where allocation is determined by willingness to pay.

Assessed-value voting and heterogeneous preferences are not efficient means to allocate water and costs (because votes do not correlate with values for water). Instead, one wants a system for allocating water, and the revenue from selling that water, to member agencies in proportion to historical facts and customer metrics. Such a system realigns member interests around a single goal—maximizing revenue while preventing shortage—such that all members can agree to use it in the knowledge that any short-run losses that they may experience will turn positive in the long run due to a minimization of internal conflict and maximization of efficiency inside MET.[9] A brief discussion of markets and prices is followed by an exposition of an auction designed to suit MET's circumstances.

Markets, prices, and fairness

Auctions for MET water would guarantee supply to whoever is willing to pay the most. Instead of the current case where a reduction in MET supplies leads to difficult negotiations among member agencies insisting their demand has not changed, increases in auction prices would gradually squeeze demand until it matched reduced supplies, preventing shortage. Auctions work. For example, experimental auctions have been used to allocate the United States' space station's limited capacity among numerous claimants insisting that their essential needs deserved priority over others.[10]

Simple to understand, explain, and implement, auctions increase "procedural utility" from participating in a transparent and fair mechanism, are flexible and robust; respond to changing conditions, and allocate with price—not political, bureaucratic, or engineering methods—thereby reducing conflict and increasing trust.[11] Reduction in conflict and increase in trust would make it easier for members to turn their attention to other projects where cooperation could help everyone, a useful spillover.

Markets would end members' reliability worries because they would always be able to buy reliability (additional supply) by bidding higher prices for water. Such assurance would alleviate the need to spend large amounts of money and years of effort on investments for backup water supplies (e.g., desalination). Prices would also serve as a clear indicator for cost-benefit analyses for capital expenditure. If prices rise high enough, member agencies will look for other sources of water or ways to reduce demand, but higher prices are unlikely to push member agencies out of MET. First, because MET will still be a very large provider of water to a region where additional water is likely to be quite expensive. And second, member agencies will have the right to a baseline quantity of water (see below) that will be cheap and may be sufficient to supply all their needs. (Auctions within MET would not create adverse impacts outside of MET's service area as they would merely reallocate water among MET member agencies.)

MET would need to have two markets, one for conveyance and another for water. MET's current system of PSP includes the cost of conveyance in the price of water, but these are not perfect complements as conveyance capacity can be scarcer than water itself, a lesson we learn from traffic jams.[12] With PSP, it is not hard to see how a price that is right for water but low for conveyance can lead to shortages of conveyance. This problem is most obvious when member agencies face the choice of paying a wheeling charge to move non-MET water. MET's high wheeling price has

surely eliminated water trades that would be economically feasible with wheeling charges that reflected the marginal cost of moving water. Flexible conveyance prices would equalize supply and demand as well as signal bottlenecks that need expansion. But because water and conveyance auctions can be run interdependently,[13] one may assume that conveyance auctions will not interfere with water auctions and ignore them in the discussion that follows.

Wholesale auctions at MET will result in water prices that rise and fall, price swings that could be passed through to customer's retail prices. Although fluctuating prices introduce volatility, they need not trouble users who already deal with price changes for gasoline, meat, and other commodities, especially when these price fluctuations help eliminate shortages. Indeed, it has been calculated that the use of higher prices (instead of rationing) during drought increases average household welfare by the equivalent of one-third of all water spending in the year.[14]

One concern is whether auctions deliver water to rich member agencies at the expense of poor ones. Although it is possible to allocate all of MET's water in auctions, it is also possible to set aside a baseline quantity to every member agency based on the number of people each serves. Recall that 135 lcd is adequate for health and economic development; yet current average consumption at MET is 811 lcd. Lower baseline quantities will increase the quantity of water priced and allocated by auction, which will increase water allocation efficiency and revenue to member agencies that use less than average quantities of water. MET's member agencies will need to decide this baseline number through a political process.

Auctions at MET

The academic literature on auctions goes into great detail on issues such as speed of allocation and maximization of revenue, but MET's structure as a cooperative (selling water to members who also divide the auction revenue) means that these debates are not overly important here. This auction design allocates water to high bids, with all winning bids paying the same price, and revenue distributed to members through a known formula. The following paragraphs spell out how this would work.

Every day MET estimates its sustainable supply, deducts baseline quantities, and puts the remaining x units of water up for auction. (Member agencies already order water daily.) Member agencies bid for water, and the highest x bids are accepted. All bids pay the same price, equal to the $x+1^{st}$ bid. These bids are submitted in an auction with a "soft ending," that is, an auction does not end until a few minutes without a bid have elapsed. This design ensures that members always have the chance to get as much water as they are willing to pay for.

Revenue from water auctions will probably exceed PSP revenue (any shortfall could be covered using MET's current property tax mechanism). PSP revenue will also be replaced by revenue from conveyance auctions that pay for costs and allocate scarce capacity (conveyance prices will be zero if capacity exceeds wheeling demand; taxes in proportion to wheeling can cover shortfalls). But the most likely case is that water scarcity results in higher water prices and auction revenue that exceeds PSP costs. In this case, revenue in excess of costs can be rebated to members in proportion to:

- Past taxes: Until the early 1970s, a majority of MET's revenue came from taxes. Los Angeles paid about 70 percent of all property taxes—just under US$3 billion in 2004 dollars.
- Preferential Rights: Member agencies hold PRs in proportion to their past payments toward fixed costs, which would allow PRs to be retired. LADWP and SDCWA (Los Angeles and San Diego) have the largest claims on PRs, with 21 and 16 percent of the total, respectively. Tax repayments would also reduce PRs.
- Population: Per capita rebates are progressive and reward efficiency.

Rebates could be sequentially or simultaneously implemented, depending on their relative importance to member agencies. Auctions will give price information to member agencies, customers, and politicians, creating "yardstick competition" among agencies to increase efficiency.[15] Frequent price updates will help managers make operating and investment decisions. Customer rebates will intensify the pressure to raise efficiency. Best of all, auctions for water and infrastructure that replace PSP will end rationing and cross-subsidies.

Conclusion

Barriers to reform can be circumvented by changing MET's water and cost allocation method to a different system that treats members fairly (in terms of their access to valuable water), rewards past sacrifices (tax payments and preferential rights), and restores MET's cooperative objectives to a single goal: Selling a reliable water supply to the highest bidder. Reform is relatively easy to implement because it does not require big changes in MET's legal or operational structures. In some ways, it simplifies operations by removing price-setting and revenue-targeting functions.

The answer to the question of why MET has not implemented seemingly obvious reform lies in its monopoly position, with customers who cannot see how inefficiency costs them, and member agencies arguing over policies that have become dysfunctional. The end of abundance provides an excuse to reconsider these policies; an excuse to consider new methods for allocating water (auctions); an excuse for customers and politicians to push for change that will manage scarcity instead of permitting shortages that damage business operations, environmental sustainability, and citizens' quality of life. The end of abundance can mean increasing conflict, but equally it might mean increasing cooperation over managing our most precious resource—water.

Notes

David Zetland is a senior water economist in the Department of Environmental Economics and Natural Resources at Wageningen University, The Netherlands. He may be reached at dzetland@gmail.com.

1. See Zetland (2011).

2. Hart and Moore (1996; 1998).

3. Heller (1998).

4. Flaxman (1976). Los Angeles' apparent very high MET water prices are offset through alternative non-MET supplies and, importantly, through the Hoover dam whose main function for the city is delivery of low hydropower costs.

5. Zetland (2011) details how LADWP subsidized MET's water prices and endorsed MET's growth to stimulate demand because, in exchange, it received cheap hydropower from the Hoover dam. Los Angeles also obtained preferential rights to MET water during periods of water shortage.

6. Zetland (2008a).

7. Estimated: Chenoweth (2008); Australia: WSAA Staff (2010).

8. Blake, *et al*. (1994).

9. Buchanan and Tullock (1962).

10. Plott and Porter (1996).

11. See, e.g., Henrich, *et al*. (2001); Benz (2004); Frey (2005).

12. Howitt (1997).

13. Murphy, *et al*. (2000) explain how smart auction markets for water integrate conveyance constraints.

14. Mansur and Olmstead (2007).

15. Shleifer (1985).

References

Benz, M. 2004. "Introducing Procedural Utility: Not only What, but also How Matters." *Journal of Institutional and Theoretical Economics*. Vol. 160, No. 3, pp. 377-401.

Blake, E.L., J.L. Guyton, and S. Leventhal. 1994. "The Coase Theorem vs. Conditional Rationality: An Experimental Investigation of the Empty Core." University of Maryland (Government and Politics). Working Paper. See: http://www.bsos.umd.edu/gvpt/oppenheimer/831/blake.pdf

Buchanan, J.M. and G. Tullock. 1999/1962. *The Calculus of Consent*. Indianapolis, IN: Liberty Fund.

Chenoweth, J. 2008. "Minimum Water Requirement for Social and Economic Development." *Desalination*. Vol. 229, pp. 245-256.

Flaxman, B.E. 1976. "The Price of Water: Who Pays and Who Benefits? A Policy Study of the Metropolitan Water District of Southern California." Masters Thesis (public policy studies). Claremont Graduate School.

Frey, B.S.and A. Stutzer. 2005. "Beyond Outcomes: Measuring Procedural Utility." *Oxford Economic Papers*. Vol. 57, pp. 90-111.

Hart, O. and J. Moore. 1996. "The Governance of Exchanges: Members' Cooperatives versus Outside Ownership." *Oxford Review of Economic Policy*. Vol. 12, No. 4, pp. 53-69.

Hart, O. and J. Moore. 1998. "Cooperatives vs. Outside Ownership." NBER Working Paper 6421.

Heller, M.A. 1998. "The Tragedy of the Anticommons: Property in the Transition from Marx to Markets." *Harvard Law Review*. Vol. 111, No. 3, pp. 621-688..

Henrich, J., *et al*. 2001. "In Search of Homo Economicus: Behavioral Experiments in 15 Small-Scale Societies." *American Economic Review*. Vol. 91, No. 2, pp. 73-78.

Howitt, R.E. 1997. "Water Market-Based Conflict Resolution." In R. Sanchez, J. Woled, and D. Tilly, eds. *Proceedings of the First Biennial Rosenberg International Forum on Water Policy: Resolving Conflict in the Management of Water Resources*. No. 93 in Water Resources Center Report. University of California Centers for Water and Wildlife Resources.

Mansur, E.T. and S.M. Olmstead. 2007. "The Value of Scarce Water: Measuring the Inefficiency of Municipal Regulations." Working Paper. http://www.som.yale.edu/faculty/etm7/papers/mansur_olmstead_water.pdf.

Murphy, J.J., *et al*. 2000. "The Design of 'Smart' Water Market Institutions Using Laboratory Experiments." *Environmental and Resource Economics*. Vol. 17, No. 4, pp. 375-394.

Plott, C.R. and D.P. Porter. 1996. "Market Architectures and Institutional Testbedding: An Experiment with Space Station Pricing Policies." *Journal of Economic Behavior and Organization*. Vol. 31, No. 2, pp. 237-272.

Shleifer, A. 1985. "A Theory of Yardstick Competition." *Rand Journal of Economics*.

Vol. 16, No. 3, pp. 319-327.

WSAA Staff (2010). "Implications of Population Growth in Australia on Urban Water Resources." WSAA Occasional Paper 25. Melbourne: Water Services Association of Australia.

Zetland, D. 2008a. "Conflict and Cooperation Within an Organization: A Case Study of the Metropolitan Water District of Southern California." PhD thesis (agricultural and resource economics). Davis, CA: University of California, Davis.

Zetland, D. 2008b. "Focal Points in Public Goods Games: Explicit Information Increases Reciprocation." Working Paper, SSRN Working Paper 1122144.

Zetland, D. 2009. *Conflict and Cooperation Within an Organization: A Case Study of the Metropolitan Water District of Southern California*. Saarbrücken, Germany: VDM Verlag.

Zetland, D. 2011. "Intra-organizational conflict: Origin and cost." *The Economics of Peace and Security Journal*. Vol. 6, No. 1, pp. 12-21.