EXTERNALITIES AND INTEGRATED RESOURCE PLANNING

Jeffrey L. Jordan
Professor of Economics
University of Georgia

One of the hallmarks of integrated resource planning (IRP) is the consideration of the environmental consequences of water resource decisions (Jordan, 1995). Any least-cost analysis of a water program must include a recognition that the costs and benefits of any project go beyond the direct costs to a utility. In fact, integrated resource planning attempts to consider all direct and indirect costs and the benefits of demand side management, supply side management, and supply augmentation. In short, what an IRP process requires is the consideration of the externalities of any water resource program.

EXTERNALITIES DEFINED

Economists have long examined externalities. Externalities are, indeed, common to all human interaction. The term, however, has been employed so loosely in many instances to render it nearly useless for analytical use. The most general definition implies that some effect external to the actor is somehow not properly taken into account. For water utilities, the definition of an externality is a cost (or benefit) that relates to providing water service but is external to the utility and is not included in the utility's cost (or benefit) of service. This definition includes the basic nature of an externality: that a firm is using resources for which it does not pay, or conveys benefits for which it is not compensated.

When a water utility accounts for, and includes in it's cost of service, an externality, this is known as "internalizing" the externality. The Clean Air Act forced the internalization of externalities in the electric power sector by requiring the adoption of compliance technologies. In contrast, the Safe Drinking Water Act did not produce the same effect since the contaminants at issue are often not the direct result of water service provision.

The classic example of an environmental externality is pollution. An industry that dumps waste into a river is using a resource (the river) in its production process. Without the existence of the river, the firm would have to pay to find an alternate waste disposal technique. Since the firm uses the river resource without paying for its use, the costs of production do not reflect the total costs of the production process. That a cost exists is clear, however, it is not reflected in the production process of the firm. Someone or something (fish and wildlife) is paying the cost. The issue is to "internalize" the cost of the externality to reflect the actual cost to society of the production process and to make the producer of the externality bear its cost.

Similarly, accounting for external benefits is necessary. Identifying many external costs and benefits is possible. They include pollution, occupational risk, and health and safety impacts. Benefits external to production processes include employment effects, national security, competitiveness, improved living standards, productivity, and economic growth. Externalities related to water resources include estuary impacts, river quality effects, impacts on supply sources, aesthetics, odors, air quality, recreation, wildlife, jobs, and energy savings. Externalities may differ based on whether the supply source is surface or ground water. Externalities associated with surface water will tend to produce more immediate effects (such as pollution or source adequacy) while ground water externalities also effect allocations across time. Externalities associated with water processes are complex since many environmental compliance costs are, in effect, the externalities of firms other than the water utility.

Accepting that externalities must be considered in the IRP process, the issue becomes how to internalize the costs and benefits in the production process. The basic remedy to externalities is to institute a tax equal to the marginal social damage imposed by the negative externality or implement a subsidy for a positive externality. For a negative externality, a tax would make the cost of pollution a part of the firm's production process. For a positive externality, a subsidy produces compensation for the benefit provided. Externalities in IRP's One of the places that the consideration of externalities is particularly crucial is in evaluating water conservation programs within an IRP.

Analysts can identify and quantify several types of benefits and costs associated with conservation alternatives. Direct costs result from reduced water use and changes in the need and timing of future water supply facilities. Other direct costs are related to implementing the conservation program. Typical direct costs that can be identified and quantified include utility program costs (labor, materials, economic incentives, administration, publicity, evaluation, decreased utility revenue) and customer program costs (materials, installation, operating and maintenance).

Direct benefits of conservation programs also can be readily identified and quantified. Typical direct benefits that can be included in a benefit/cost analysis include utility costs such as lower costs of chemicals, energy, labor, and materials, reduced purchases of raw or finished water, reduced operation and maintenance, lower costs of capital facilities for supply, and wastewater facilities. Benefits that can be identified to program participants include reduced water bills, energy bills and wastewater bills, and reduced costs of lawn maintenance due to efficient irrigation. These costs and benefits can then be used in a benefit/cost analysis to determine the net present value of the program, its internal rate of return, and discounted payback period.

Many externalities, including indirect costs and benefits not identified above, can be both recognized and quantified. Simply because an externality exists, does not mean it cannot be identified and quantified. Among the positive externalities that can be included in a benefit/cost analysis would be the benefits from reducing hydraulic loads in the wastewater treatment process such as reduced sewer overflow, plant bypass, or clarifier washout events. Some water quality effects of conservation programs can also be quantified such as savings in treatment costs due to an improved dilution capacity of a river or stream. External benefits to downstream users of water quantity and quality can also be quantified.

The economic benefits to a community in terms of consumer spending on plumbing or landscape changes can be identified as well. In agricultural conservation programs, positive externalities such as the yield effects of improved soil conditions, and reductions in diseases and pests can also be quantified. There remain externalities that can be identified but not easily quantified. These include the effects water conservation may have on wildlife, wetlands, estuaries, aesthetics, and recreation and other quality effects, such as odors and air quality.

Because no market exists for these environmental impacts (except where recreation fees are charged), it is difficult to include these known effects in a benefit/cost analysis. Further, it is difficult to directly trace the connection between lower water use and costs and benefits in these areas. The use of willingness-to-pay surveys, and other types of nonmarket valuation techniques, can aid in program evaluation.

CONCLUSION

In conducting an IRP, all costs and benefits, including externalities, must be considered. The purpose of considering externalities is to improve the allocation of utility resources and the economic efficiency of operations. The challenge this presents is how best to identify and quantify these external effects within benefit/cost analysis.

Methods of valuing externalities are often beyond the ability of individual utilities. Further, externalities often occur across existing political boundaries, creating an issue similar to the problems of the commons. Considering externalities may be most important for statewide or regional planning where externality issues expand as population and jurisdictions increase. Regional water management may be a superior mechanism for considering water supply conservation externalities rather than the individual water utility. It is also at a regional level where incentives could be considered to assist utilities in internalizing the costs or benefits of externalities.

REFERENCES

Jordan, J.L. "Incorporating Externalities in Conservation Programs." *Journal AWWA.* 87 (6): 49-56.

THE AUTHOR

Jeffrey L. Jordan is a Professor in the Department of Agricultural and Applied Economics, The University of Georgia, Griffin. Jordan is a member of the Planning and Evaluation subcommittee of the AWWA's Conservation Committee and is past Chairperson of the Spalding County (GA) Water Authority.