equilibrium (whatever that means), it will be necessary to "(1) structure the laws to make government less susceptible to special interests; (2) place more power in the hands of the people; and (3) strike at the very sources of illegitimate private influence." In elaborating on these three points the group recommends that it be made mandatory upon the EPA to exercise its power to bring enforcement proceedings against polluters. It suggests also that private citizens be allowed to bring their own suits against polluters and nonfeasance suits against recalcitrant public officials who do not carry out their mandate to pursue violators of antipollution laws. In addition, it recommends that executives of firms violating antipollution legislation be held personally responsible for the firms' actions and if found guilty of repeated violations be barred from positions of responsibility in the industry.

There are several other recommendations, concerning the fines for polluters, the potential role of EPA as a source of information for the public on pollution matters, and methods for preventing firms from practicing economic blackmail where environmental restrictions are pressed. All of these recommendations (and more) are designed to lead sometime in the future to a "no dumping" policy—a vague and ambiguous concept and one which they fail to define. While discussing implications of these recommendations and the final objective ("no dumping"), the authors treat the problem of possible economic (or social) dislocations in a rather ambiguous fashion, sometimes implying that they will be slight and at other times discussing elaborate schemes for controlling their effects. Although their treatment of these problems may leave the reader somewhat confused, still their belief is well founded that many a firm may use the environmental issue to screen other problems that may have contributed more to its need to reduce its work force. (Apparently this is what U.S. Steel is doing now in Buffalo, New York.)

To sum up, *Water Wasteland* does present a picture of the failures of the administrative and regulatory agencies in our pluralistic society, the weaknesses of existing and pending legislation, and some callous attempts of industry to subvert abatement efforts. What is missing from the book is any semblance of an ecological framework for analyzing and proposing solutions to environmental problems. One is left with the uncomfortable feeling that: (i) the "no dumping" goal of the Nader group reflects a lack of understanding of trade-offs between water and land or air pollution; (ii) the group believes the people of this country are willing to pay for the level of water quality the group desires; and (iii) its criterion of success is the government's and citizens' willingness and ability to do battle in court with big polluters. The group espouses the view that one of the largest obstacles to realizing clean waters is the present administrative structures of our federal and state bureaucracies. Although the reviewers agree that administrative restructuring is necessary, in no sense is it sufficient. In particular, a lack of understanding of the ecology of our environment will surely lead to administrative decisions that will aggravate water pollution problems; and if "no dumping" becomes the chosen solution, it may only serve to produce totally unacceptable dislocations in our economy and foment greater resistance to the environmentalist movement. This is not meant to suggest that we do nothing until the experts have provided all the answers, but rather that, in redirecting our priorities and reallocating our moneys, we remember that some serious social, economic, and scientific questions remain unanswered.

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Note

1. Growth of population and of sewerage facilities, 1900–1962. Data from L. W. Weinberger, D. G. Stephan, and F. Middleton, *Ann. N.Y. Acad. Sci.* **136**, 134–54 (1966).

Population	Growth per year (%)	Correlation coefficient*
Total	1.35	.997
Urban	2.07	.995
Served by sewers	2.42	.995
Served by sewers and treatment plants	4.64	.968

* For the functional relationship of the type $x_i = \exp r_i t$, where x_i is the population, r_i is the growth rate, and t is time.

Hard Lessons from the Workaday World

New Tools for Urban Management. Studies in Systems and Organizational Analysis. RICHARD S. ROSENBLOOM and JOHN R. RUSSELL, with contributions by Carter F. Bales, Robert P. O'Block, and Mahlon Apgar, IV. Graduate School of Business Administration, Harvard University, Boston, 1971. xiv, 298 pp., illus. $8. Harvard Studies in Technology and Society.

This is not, despite its title, a how-to-do-it book for model building, data analysis, or computer simulation. Instead it is a rather nice compendium of hard lessons learned by several experienced model builders, analysts, and simulators in the workaday world. In a series of case studies in five separate settings where analytic techniques have been brought to bear on significant problems in urban management, they trace out some of the practical difficulties and suggest a few of the prospects for urban policy analysis. The emphases and biases are hardheaded and pragmatic, not theoretical or technical, and the chief strength of the book is the commonsensical character of the sophistication exhibited in the cases.

A fundamental, recurring message is clearly aimed at technically skilled but politically naive analysts searching for ways to cure urban ailments: the major systemic constraints are political, economic, administrative, and operational, not simply methodological.

> . . . the scale and complexity of many urban problems, particularly social problems, are substantially greater than those customarily encountered by defense and space industries . . . [and] the institutions responsible for coping with urban problems are not well suited for the management of change on such a scale [pp. 19–20].

Chapter and verse detail some implications of this thesis.

Russell in his "Demonstrations of systems analysis in two urban jurisdictions" reports first on an attempt to develop an economic model of the "subemployment system" for the city of Dayton, Ohio. The model itself is of slight interest, but the frank discussion of the difficulties in doing the work is quite revealing. The requirements of the problem were relatively clear in abstracto, but practical constraints dominated the problem-solving process in situ. The analysts were faced with making critical, tenuous, and largely unsubstantiated assumptions

about the environment; a time constraint—something useful for city policy makers was to be produced within four months—forced certain understandable compromises in the research design; data did not exist in sufficient quantities or suitable formats for analytic purposes; little consensus existed about effectiveness criteria for key policy-making bodies; simply defining the system and what should be included and excluded in the analysis was nearly impossible; the analytic question of how to improve the subemployment situation in Dayton had no clearly discernible connection to city policy makers, that is to say, the city had the problem but the feds had the discretionary resources; not only was the city probably the "wrong" client, the analysts had few opportunities or incentives to interact over the analytic period with city administrators. In his second case, Russell reports on the moderate successes achieved in using straightforward operations-research techniques to choose locations for new firehouses in the city of East Lansing, Michigan. The main difference between the two experiences is that the technical problem was simpler in the second.

Bales contributes additional insights in "The progress of analysis and PPB in New York City government." Variability in the extent and quality of the analysis done by various agencies in New York City is considerable and appears to be related to the attitude of top managers in each instance and to the existence of understood and measurable criteria of performance for the agency. Accordingly, the Human Resources Administration and the Parks, Recreation, and Cultural Affairs Administration have fared less well than either the Fire or the Police Department, where over a three- or four-year period some distinct progress has been made toward using innovative analytic methods. Despite some successes, Bales is not particularly sanguine about prospects, given their dependence upon several key personalities (whose tenure is, of course, uncertain), the tendency of bureaucracies to compel conformance to traditional patterns of behavior, and the demonstrated high turnover rate of the few individuals possessing the required analytic skills.

O'Block, in "New Jersey Finance Agency," outlines a computer model built for that agency and concludes that "the computer system replicates the numerous hand calculations traditionally performed in housing analysis." Rationalizing existing bookkeeping procedures is a far cry from doing scientific analysis; the degree of acceptance by policy makers and frequency of use attained by this simple accounting device may indicate just how little analytic sophistication many present-day operating systems can absorb. Implied is the need to learn what policy makers routinely do and what operating forms and terms have common currency, and then to build slowly from that level to more comprehensive and rigorous analyses. To a computer programmer, merely finding a format for labeling outputs to look like those normally used by the policy maker is a trivial enough chore, but it may spell the difference between cautious acceptance and outright or threatened rejection.

Apgar, in "Systems management in the new city," repeats the theme that simple formulations get used. Examining the history of land-use development and planning for Columbia, Maryland, Apgar presents a very complex accounting management model that was programmed, then scarcely used. On the other hand, simpler techniques such as brainstorming ("the work group," in his parlance) and visual Gantt charts of the progress of development were used. A number of plausible reasons why the one form of analysis should be set aside in favor of more prosaic ones are enumerated: advocates of the more sophisticated techniques could not argue that increased benefits commensurate with the increased costs had accrued; the project leadership had some persistent need to be shown how and why sophisticated analysis could do the job better; and actual management procedures in the context of planning a large, complex project were fluid, rough and ready, and therefore not amenable to rationalized, systematic analysis. The subtle dictum "Model simple, but think complex" is worth mentioning here because it accurately captures the spirit of the Columbia case.

In addition to its many virtues, *New Tools for Urban Management* has its weaknesses. In setting up their thesis and what they call in the introductory chapter "the dilemma" between systems and their self-styled "operational" analysis, the authors have taken an uncharitable and unwarranted view of systems analysis, assuming the most rigorous case for its methods and procedures:

> For some issues, largely those arising in connection with "hard" systems, credible *systems* analyses are still feasible because the analyst can focus on central factors for which data are available and the level of complexity is manageable. For other issues, where complexity is greater or data less reliable, credible outcomes can be attained only for *operational* analyses [p. 226].

This basically ignores the fact that systems analysis has been regularly characterized by a range of rigorousness and difficulty, from the hard and quantitative to the loose and sloppy. In fact, this is what systems analysis is all about. It is

> a systematic approach to helping a decisionmaker choose a course of action by investigating his full problem, searching out objectives and alternatives, and comparing them in the light of their consequences, using an appropriate framework —insofar as possible analytic—to bring expert judgment and intuition to bear on the problem [E. S. Quade and W. I. Boucher, Eds., *Systems Analysis and Policy Planning* (American Elsevier, New York, 1968), p. 2].

What is needed now is less emphasis on syntactic virtuosity and more attention to such important concerns as the careful detailing of the limitations of existing urban-based theory and data. The paucity of theoretical references in every one of the cases in this book is testimony to the general deficiency of theoretical material from which specific analytic models could be constructed. In the absence of much usable theory, we are presented with an array of bookkeeping routines, Gantt charts for scheduling operations, and some crude, verbal descriptions of specific projects as they developed over time. The fault is not entirely the authors', for there is very little information from which decent theory could be developed. On the other hand, it might be worthwhile to begin cataloging the deficiencies of urban data so as to relieve policy analysts of the burden of rediscovering for themselves just how constraining poor, noncomparable, and nonexistent data bases can be.

In summary, Rosenbloom, Russell, and their various contributors are to be commended for spelling out in considerable detail many of the problems confronting serious urban policy analysts. One must begin to take seriously the profound mismatches that exist between available analytic tools, the current quality and quantity of theory and supportive data, and what policy makers desperately require and are capable of understanding and utilizing.

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