Scientific Data and Public Policy

The Scientific Basis of Health and Safety Regulation. Papers from a conference, Washington, D.C., Nov. 1979. ROBERT W. CRANDALL and LESTER B. LAVE, Eds. Brookings Institution, Washington, D.C., 1981. xvi, 310 pp. Cloth, $26.95; paper, $10.95. Studies in the Regulation of Economic Activity.

Since the 1950's, when the relationship between science and government became an explicit concern of scholars, thousands of pages have been devoted to discussing how technical information is used (or abused) by policy-makers. The unusual feature of the present contribution to this large literature is the juxtaposition of papers by a scientist, an economist, and a regulator for each of five regulatory decisions. The reader is thereby provided raw material that demonstrates the extent to which technical information underlies regulatory decisions.

The cases illustrate decision-making under several of the so-called "social regulation" statutes of the 1970's in four different agencies: the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the National Highway Traffic Safety Administration, and the Consumer Product Safety Commission. The subjects of regulation are: passive restraints for automobile passengers, cotton dust, saccharin, waterborne carcinogens, and sulfur dioxide. In each of these cases, epidemiological or laboratory test data (or, in the case of passive restraints, other aggregate data) form the basis for the determination that there is a human health or safety hazard. However, as virtually all the writers point out, these data are open to questions of interpretation. Although the data are good enough to indicate that there is a risk, they are usually not good enough to establish the level of risk with certainty. This gives policy-makers a large measure of flexibility in using the scientific evidence as a basis for policy-making.

For each case, the scientist's view is presented first, then the economist's, and finally the regulator's. This order implies a model of the policy process in which scientific research, perhaps conducted independently of any policy needs, points to the existence of a health or safety hazard. The resulting scientific data become the basis for an economic analysis of costs and benefits, and both are then used by regulators as the basis of decisions. Since the scientific evidence is used by regulators both directly and indirectly through the cost-benefit analyses, uncertainties in the data are compounded. Thus it is not surprising to find the regulators arguing against a too-strict use of cost-benefit analysis or for an "intuitive" approach to regulation. For example, Kimm *et al.*, discussing waterborne carcinogens, note that estimates of the risk of chloroform differed by an order of magnitude. They argue, "It is hard to imagine many cost-benefit analyses whose conclusions would not be changed if one side of the balance were multiplied or divided by one hundred or one thousand." Decision-makers, therefore, can best use uncertain data to compare risks or set priorities.

In their introduction to the volume, the editors comment on the irony of using case studies—the softest of data—to ascertain the extent to which "hard analysis" is used by decision-makers. They also admit to a bias that decision-makers are not using hard analysis enough. Yet the cumulative effect of the cases was to make this reader more, not less, sympathetic to "intuitive" regulation. The views of the economists in particular often seem arbitrary or more concerned with method than reality. For example, John Morrall III, commenting on cotton dust, suggests a more cost-effective regulatory standard than OSHA's specific dust-level standards: no employer shall allow an employee to progress to the advanced stage of byssinosis. This would allow employers to adopt efficient combinations of safety measures, including engineering controls, respirators, medical transfer programs, and safer grades of cotton. Yet Morton Corn's regulatory perspective highlights the lack of effectiveness of respirators and the fragile economic status of the industry that would militate against widespread use of safer grades of cotton.

In addition to the difficulties of cost-benefit analysis caused by problems with the scientific data, economic data contain their own uncertainties. Williamson notes, for example, that the National Academy of Sciences panel on saccharin would have been more responsive to economic concerns if either the aggregate or disaggregated demand curves for saccharin had been available. Thus scientists and decision-makers alike have reason to distrust cost-benefit calculations. Decision-makers' distrust is heightened by the fact that economists seem to fail to recognize that political values are a legitimate component of political decision-making. OSHA's emphasis on engineering controls of workplace hazards stems less from a stubborn disregard of economics than from a need to be very responsive to unions. The tendency of the lay public to regard risks to known populations as unacceptable also permits OSHA to make high per capita expenditures on its life-saving programs with public acquiescence (see J. D. Graham, "Some explanations for disparities in lifesaving investments," *Policy Studies Review*, in press).

Curiously, the papers by the regulators are perhaps the least stimulating part of each case. As the editors note, the regulators seldom consider whether additional technical information would have altered their decisions or allowed them to make better ones, nor do they note whether it would have been politically possible to wait while new data became available. In short, the regulators tend to focus on shortcomings in the available data rather than discussing the role information does or even should play. For example, several of the scientific and economic papers provide ranges of data; this is typical of the kinds of information available to regulators. Lave (an economist) notes that the usual regulatory reaction is to choose the most conservative assumption at each stage, and thus to ignore a lot of valuable information. None of the regulators addresses this important concern.

The size of the literature on the use of technical information by decision-makers attests to the difficulty of generalizing or theorizing about this subject. Jurgen Schmandt suggests that we should proceed to study it in two stages: first, to determine how policy-makers acquire, analyze, and aggregate relevant technical information; and, second, to learn what impact that information has ("Toward a theory of the modern state: administrative versus scientific state," in *Technology and International Affairs*, Praeger, 1981, pp. 66 and 83ff.). The present volume facilitates the first task by juxtaposing the scientific and economic information that was available to the regulators with the regulators' presentations of similar data. The volume was intended to illumine the second question, however; it fails in this primarily because of the attitudes adopted b··

the regulators themselves in their papers. Because of this, I would have found editorial comment on each of the cases helpful—pointing out any discrepancies among the authors' scientific data, for example, or showing how the regulators refer indirectly to technical information.

Scientists who read this book will also find implicit in it lessons on their role in policy-making. As neutral information sources they maintain credibility and avoid the discomforts of involvement in political controversy, but they also run the risk that decision-makers will simply not make use of as much of the information as they could. Most of the scientific papers do make guarded policy suggestions, although several of these emphasize the need for more or better research. For example, Huelke and O'Day implicitly argue for a demonstration airbag program when they say that there is no substitute for experience when attempting to evaluate restraint systems. Grobstein responds to the difficulties of assessing data on weak carcinogens such as saccharin by suggesting that scientists (and policy-makers) should develop strategies to reduce the overall carcinogenic burden.

The substance of the five cases is presented in a way that is accessible to a wide audience; together the papers provide the reader with both the basis and the stimulus for considering the more difficult questions about the role that technical information can and should play in policy-making. If it encourages some scientists or economists to present data in a way that is germane to decision-makers and stimulates some policy-makers to consider more fully the importance of technical information to their social purposes the book will achieve at least part of its purpose.

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Intertidal Ecology

The Ecology of a Salt Marsh. L. R. POMEROY and R. G. WIEGERT, Eds. Springer-Verlag, New York, 1981. xiv, 274 pp., illus. $29.80. Ecological Studies, vol. 38.

Sapelo Island, Georgia, is the site of one of the earliest attempts to understand an ecosystem, dating back to the mid-1950's. Over the years many different approaches and disciplines have been applied to resolving questions about the ecology of salt marshes. This book deals principally with the work done at Sapelo Island but also covers research done elsewhere on the eastern coast of North America.

"The salt marshes of Sapelo Island, with the Duplin River in the foreground." [From *The Ecology of a Salt Marsh*]

The book refreshingly starts without a self-conscious effort to justify the study of salt marshes. After an overview chapter there are reviews of research on water and sediments, primary producers, aquatic consumers, grazers and predators, aerobic and anaerobic microorganisms, nitrogen and phosphorus cycles, and models of the Sapelo Island marsh. Most of the chapters have the format of a literature review at an advanced level, and they are written in a dense style. The reader will have to go to the original sources for details. The lack of full development of many topics is awkward, especially where major references are still "in prep."

The most successful chapters are those on the grazers and the anaerobic microorganisms. The chapter on grazers is the easiest to read and includes enough interesting details of natural history (for instance, that marsh flies and ants lap up sugars released by leaves damaged by the feeding of phloem feeders and grasshoppers) to provide a sense of the marsh as a living system, while also conveying what is known of the more abstract ecological topics. The chapter on anaerobics appropriately includes some general information about the processes involved. It then discusses some of the important anaerobic processes occurring in the Sapelo and other salt marshes. Both these chapters point out how preliminary our understanding is, even in this relatively well-studied ecosystem.

In the chapter on primary production the section dealing with grass production has a curiously static quality, even though rates of processes are repeatedly mentioned. A more dynamic view might have been provided by discussing the course of events that determine the cycle of primary production over a growing season, with an explanation of the succession of factors that control growth during different parts of the season.

The chapter on modeling is a narrative of the various stages of development of work on models. It is long on introduction and descriptions and short on new ideas generated by the model, despite considerable effort. Although the model probably helped frame questions for the research, this chapter does not add much. The final chapter of synthesis is interesting, but the authors could have profitably allowed themselves more time and space for integrating results from earlier chapters and attempting a broader synthesis.

This book does not provide novel theory, although there are a number of subjects in it that could be the basis for development of theoretical work, such as exchanges between adjoining ecosystems or couplings between nutrient cycles and dynamics of competition and predation. The authors point out controversial subjects concerning which there are still major contributions to be made, including export and import of materials, hydrology of tidal and interstitial water, the geochemistry of anaerobic process-