

center and the entire geometric shape is represented by that value. The third section discusses the influence of area shape.

Chapter 3 is concerned with the accuracies of averaging methods given the statistical characteristics of the fields. Four subsections are presented including the accuracy of representing average quantities by discrete data, approximate evaluation of the averaging accuracy, optimal averaging of discrete data, and accuracy of averaging the characteristics of statistical structure. In this chapter Kagan develops optimal averaging, relates it to optimal interpolation, and describes several attributes of the optimal averaging method.

Chapter 4 discusses the problems of averaging meteorological fields using precipitation and temperature fields as examples. This is particularly relevant these days, as several efforts have been made to produce global gridded datasets of these two variables for climate change studies. These are also good examples to discuss the limitations of the averaging methods. The spatial and temporal correlation of temperature is generally much greater than that of precipitation.

Chapter 5 gives the practical aspects of the spatial averaging of meteorological fields. Subsections include methods of averaging and numerical applications, a description of the averaging algorithms, and the comparative accuracy of some averaging algorithms. The editors caution that much of the material regarding the computer algorithms is no longer applicable, but nonetheless, there is some valuable information here. Enough basic concepts are provided such that readers could probably write their own computer code based on these methods, and the detailed examination of the differences between methods helps to put the different techniques in perspective.

The reference section is divided up into two parts. The first group contains references appearing in mostly

Russian journals and books, and the second group represents some international literature. The editors did not append more recent works, so the references are only given up to when the original book was published (1979). Some historical aspects of averaging methods are nicely revealed in this list. Several references given are from the early 1900s, such as Thiessen's 1911 *Monthly Weather Review* paper on precipitation averages for large areas.

The book is generous in mathematical formulation, and a working knowledge of calculus is required to fully grasp all of the concepts. I would not recommend the book solely as a text for a course on objective analysis (it was not written as such anyway), but it could serve as supplementary material. It is unfortunate that the book is so expensive—hopefully libraries already have or will soon acquire a copy. For those who work regularly with objective analysis problems, the book is worthy of shelf space.—*Timothy J. Brown.*

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## References

- Daly, R., 1993: *Atmospheric Data Analysis*. Cambridge University Press, 457 pp.
- Gandin, L. S., 1965: *Objective Analysis of Meteorological Fields*. English translation, Israel Program for Scientific Translation, 372 pp.
- , 1993: Optimal averaging of meteorological fields. Office Note 397, U.S. Dept. of Commerce, 67 pp.
- Thiébaux, H. J., and M. A. Pedder, 1987: *Spatial Objective Analysis: With Applications in Atmospheric Science*. Academic Press, 247 pp.

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**Human Choice and Climate Change.** S. Rayner and E. Malone, Eds. 1998. Hardbound. Battelle Press. (Vol. 1: The Societal Framework. 536 pp. \$75.00. ISBN 1-57477-049-7. Vol. 2: Resources and Technology. 496 pp. \$75.00. ISBN 1-57477-046-2. Vol. 3: The Tools for Policy Analysis. 474 pp. \$75.00. ISBN 1-57477-047-0. Vol. 4: What Have We Learned? 208 pp. \$60.00. ISBN 1-57477-048-9).

Decades from now, when we look back on the be-

ginnings of the “global climate change” era of science, one of the successes that we will recognize is the role that this science has played in stimulating interaction between disciplines. Not only has the issue of climate change stimulated inquiry between, for example, atmospheric and biological scientists, but it has also stimulated interactions between the physical and social sciences, as well as the humanities. In an academic environment where reductionist approaches have long held favor, the cross-fertilization of disciplines and the

integration of knowledge have great value beyond whatever particular policy outcomes emerge from the global climate change era.

*Human Choice and Climate Change* reflects both how deeply the issue of global climate change has permeated into once unconnected areas of inquiry and the significance of a broad range of knowledge to what was once defined simply as an "atmospheric" problem.

The series consists of four volumes: *The Societal Framework of Climate Change*; *Climate Change, Resources, and Technology*; *The Tools of Policy Analysis*; and *What Have We Learned?* The editors have two goals for the first three volumes, first to serve as an introduction to the social science relevant for the climate change issue to those not familiar with this area (including physical scientists) and second to provide a reference work for scholars and practitioners. The fourth volume serves as an editorial overview and distills lessons, from the editors' perspective, of the first three volumes. A concise overview of the four volumes is provided in the introductory chapter to each volume (the same overview is reprinted in each volume).

What follows is a high-level review of the four volumes (a Web site with more detailed reviews of individual chapters is listed at the end of this review), but first a brief word on how we went about the review, as it is unorthodox as book reviews go. As *Human Choice and Climate Change* is an interdisciplinary endeavor, we have taken an interdisciplinary approach to its review. Ten of us have shared responsibility for the review, coming from a range of disciplines: statistics, geography, philosophy, anthropology, political science, economics, and physics—and from a range of stages in our careers, from graduate student through senior scientist and tenured professor. Although we come from different disciplines that have, for the most part, had limited interactions in the past, we have each been shaped in some way by the global climate change era and therefore share a common research interest in the issue of global climate change.

Our bottom line assessment of the series is mixed. We find much of value in the books; indeed, there is nothing else like it available in the literature. It fills an important niche. But at the same time we find the organization somewhat confusing and quality of presentation uneven. The sheer magnitude of information included in the series limits its accessibility.

The series sees the world through "a social science lens" (Vol. 1, p. ix). According to the International Advisory Board for the project, "it is a fundamental assumption of the project that the social sciences have

ways of defining and analyzing the issues grouped under global climate change that are distinct from, yet potentially complementary to, those used in the natural sciences, and that social science analyses can generate findings of relevance to the policy making community."

While the fundamental goal of *Human Choice and Climate Change* is to be "policy relevant," the volumes are not intended as a social science equivalent to the Intergovernmental Panel on Climate Change. Rather, the chapters reflect "the individual points of view on the climate issue from [the] 120 authors and contributors, representing a score of countries," G. Stokes, associate director of the Pacific Northwest National Laboratory, writes in the preface (Vol. 1, p. xi).

While the physical and natural sciences have been pursuing the questions of how much humans might affect climate, how fast these changes might take place, and what the regional effects of these changes might be, our authors have added another question: Even if we knew how climate were to change, what could we do about it and how would we decide to do it? Our assessment is that this question, among others, reveals a lack of fundamental knowledge of how society operates and merits addition to the climate change agenda (Vol. 1, p. xii).

The series editors note that "choice lies at the heart of not only the climate change issue but also the social sciences" (Vol. 1, p. xiv).

We agree that there is an enormous amount of valuable material in these volumes. But our main criticism is that the volumes are not well organized, nor are many of the chapters particularly readable by a broad audience.

The reasons for the organization of the volumes are not transparent. Chapters are variously organized around disciplines, methods, and substantive areas. To be sure, each of the areas is relevant, but one is left wondering, "Why these areas? Why these tools?" If there is a systematic organizational logic, it is difficult to see. As is generally the case with multiauthor volumes, the quality of the various chapters is uneven. For instance, chapter 1 of Volume 1 is a useful, if jargon-laden, summary of the literature on science and technology studies, but it fails to meet the promise of its title, "science and decision making," and is unlikely to be accessible to most scientists. On the other hand, chapter 5 of Volume 3 is a comprehensive review of integrated assessment modeling and does a much better job of meeting the stated goals of the series.

This unevenness across the volumes means that care should be taken by the reader in evaluating what is presented in the different chapters. This is particularly true for instructors who assign parts of the book for students. Jargon is a constant problem, and some chapters seem to be written for audiences that already have expertise in the subject area rather than for an interested outsider. This lack of accessibility presents a significant obstacle to nonspecialists and limits the value that they will get from the series.

As far as practicing scientists who find themselves learning "more and more about less and less," the volumes provide welcome attention to the breadth of knowledge in the social sciences that is relevant to the issue of climate change. But it is exactly this breadth that might keep the volumes from receiving a broad audience. The summary, Volume 4, fills in some respects the need for a readable, integrative summary of the volumes. Yet this summary is handicapped by the apparent lack of an overall conceptual framework for the other three volumes.

We agree that the volume should be on the reading list for students who are pursuing advanced degrees in fields that contribute to policy debate on climate change—including the physical and social sciences, as well as the humanities. For specific disciplines, the vast amount of literature covered in, say, chapter 5 of Volume 1, on institutional frameworks, provides both an entree to the broader literature in the commu-

nity and also a useful review of existing schools of thought. But because of the breadth of the volumes, it would take quite a bit of additional work on the part of an instructor to orient an entire course around these books. Nonetheless, the series, in part or in whole, has great potential for classroom applications.

For readers seeking broad knowledge of social science aspects of climate change, we recommend *Human Choice and Climate Change* as filling an important need in the literature. But at the same time we recommend that one not simply begin reading from page 1, Volume 1. Instead, read the summary volume first. Then select according to your interests and the quality/readability of the individual chapters. There is a vast amount of valuable information in these volumes, and for those willing to put in the effort to extract that information, the benefits will be large.

Because the series is so vast and the space for this review is limited, we have set up a Web site at <http://www.dir.ucar.edu/esig/hccc/index.html> that contains detailed reviews of selected chapters from the series.—*R. Pielke Jr., M. Betsill, M. Downton, J. Firor, D. Jamieson, R. Katz, M. Lahsen, J. Magistro, L. Mearns, and K. Miller.*

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