

清华经济学系列英文版教材

Environmental and  
Natural Resource  
Economics Fifth Edition

环境与  
自然资源  
经济学  
(第5版)

Tom Tietenberg

著



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清华经济学系列英文版教材

# 环境与自然资源经济学

第5版

**Environmental and Natural  
Resource Economics**

**【Fifth Edition】**

Tom Tietenberg  
*Colby College*

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# 出版说明

为了适应经济全球化的发展趋势,满足国内广大读者了解、学习和借鉴国外先进的管理经验和掌握经济理论的前沿动态,清华大学出版社与国外著名出版公司合作影印出版一系列英文版经济管理方面的图书。我们所选择的图书,基本上是已再版多次、在国外深受欢迎、并被广泛采用的优秀教材,绝大部分是该领域中较具权威性的经典之作。在选书的过程中,我们得到了很多专家、学者的支持、帮助和鼓励,在此表示谢意!清华经济学系列英文版教材由清华大学经济管理学院和北京大学经济学院杨忻、李明志、钟笑寒、姚志勇等老师审阅,在此一并致谢!

由于原作者所处国家的政治、经济和文化背景等与我国不同,对书中所持观点,敬请广大读者在阅读过程中注意加以分析和鉴别。

我们期望这套影印书的出版对我国经济科学的发展能有所帮助,对我国经济管理专业的教学能有所促进。

欢迎广大读者给我们提出宝贵的意见和建议;同时也欢迎有关的专业人士向我们推荐您所接触到的国外优秀图书。

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世纪之交, 中国与世界的发展呈现最显著的两大趋势——以网络为代表的信息技术的突飞猛进, 以及经济全球化的激烈挑战。无论是无远弗界的因特网, 还是日益密切的政治、经济、文化等方面的国际合作, 都标示着 21 世纪的中国是一个更加开放的中国, 也面临着一个更加开放的世界。

教育, 特别是管理教育总是扮演着学习与合作的先行者的角色。改革开放以来, 尤其是 20 世纪 90 年代之后, 为了探寻中国国情与国际上一切优秀的管理教育思想、方法和手段的完美结合, 为了更好地培养高层次的“面向国际市场竞争、具备国际经营头脑”的管理者, 我国的教育机构与美国、欧洲、澳洲以及亚洲一些国家和地区的大量的著名管理学院和顶尖跨国企业建立了长期密切的合作关系。以清华大学经济管理学院为例, 2000 年, 学院顾问委员会成立, 并于 10 月举行了第一次会议, 2001 年 4 月又举行了第二次会议。这个顾问委员会包括了世界上最大的一些跨国公司和几家顶尖企业的最高领导人, 其阵容之大、层次之高, 超过了世界上任何一所商学院。在这样高层次、多样化、重实效的管理教育国际合作中, 教师和学生与国外的交流机会大幅度增加, 越来越深刻地融入到全球性的教育、文化和思想观念的时代变革中, 我们的管理教育工作者和经济管理学习者, 更加真切地体验到这个世界正发生着深刻的变化, 也更主动地探寻和把握着世界经济发展和跨国企业运作的脉搏。

我国管理教育的发展, 闭关锁国、闭门造车是绝对不行的, 必须同国际接轨, 按照国际一流的水准来要求自己。正如朱镕基总理在清华大学经济管理学院成立十周年时所发的贺信中指出的那样: “建设有中国特色的社会主义, 需要一大批掌握市场经济的一般规律, 熟悉其运行规则, 而又了解中国企业实情的经济管理人才。清华大学经济管理学院就要敢于借鉴、引进世界上一切优秀的经济管理学院的教学内容、方法和手段, 结合中国的国情, 办成世界第一流的经管学院。”作为达到世界一流的一个重要基础, 朱镕基总理多次建议清华的 MBA 教育要加强英语教学。我体会, 这不仅因为英语是当今世界交往中重要的语言工具, 是连接中国与世界的重要桥梁和媒介, 而且更是中国经济管理人才参与国际竞争, 加强国际合作, 实现中国企业的国际战略的基石。推动和实行英文教学并不是目的, 真正的目的在于培养学生——这些未来的企业家——能够具备同国际竞争对手、合作伙伴沟通和对抗的能力。按照这一要求, 清华大学经济管理学院正在不断推动英语教学的步伐, 使得英语不仅是一门需要学习的核心

课程，而且渗透到各门专业课程的学习当中。

课堂讲授之外，课前课后的大量英文原版著作、案例的阅读对于提高学生的英文水平也是非常关键的。这不仅是积累相当的专业词汇的重要手段，而且是对学习者思维方式的有效训练。

我们知道，就阅读而言，学习和借鉴国外先进的管理经验和掌握经济理论动态，或是阅读翻译作品，或是阅读原著。前者属于间接阅读，后者属于直接阅读。直接阅读取决于读者的外文阅读能力，有较高外语水平的读者当然喜欢直接阅读原著，这样不仅可以避免因译者的疏忽或水平所限而造成的纰漏，同时也可以尽享原作者思想的真实表达。而对于那些有一定外语基础，但又不能完全独立阅读国外原著的读者来说，外文的阅读能力是需要加强培养和训练的，尤其是专业外语的阅读能力更是如此。如果一个人永远不接触专业外版图书，他在获得国外学术信息方面就永远会比别人差半年甚至一年的时间，他就会在无形中减弱自己的竞争能力。因此，我们认为，有一定外语基础的读者，都应该尝试一下阅读外文原版，只要努力并坚持，就一定能过了这道关，到那时就能体验到直接阅读的妙处了。

在掌握大量术语的同时，我们更看重读者在阅读英文原版著作时对于西方管理者或研究者的思维方式的学习和体会。我认为，原汁原味的世界级大师富有特色的表达方式背后，反映了思维习惯，反映了思想精髓，反映了文化特征，也反映了战略偏好。知己知彼，对于跨文化的管理思想、方法的学习，一定要熟悉这些思想、方法所孕育、成长的文化土壤，这样，有朝一日才能真正“具备国际战略头脑”。

以往，普通读者购买和阅读英文原版还有一个书价的障碍。一本外版书少则几十美元，多则上百美元，一般读者只能望书兴叹。随着全球经济合作步伐的加快，目前在出版行业有了一种新的合作出版的方式，即外文影印版，其价格几乎与国内同类图书持平。这样一来，读者可以不必再为书价发愁。清华大学出版社这些年在这方面一直以独特的优势领先于同行。早在1997年，清华大学出版社敢为人先，在国内最早推出一批优秀商学英文版教材，规模宏大，在企业界和管理教育界引起不小的轰动，更使国内莘莘学子受益良多。

为了配合清华大学经济管理学院推动英文授课的急需，也为了向全国更多的MBA试点院校和更多的经济管理学院的教师和学生提供学习上的支持，清华大学出版社再次隆重推出与世界著名出版集团合作的英文原版影印商学教科书，也使广大工商界人士、经济管理类学生享用到最新最好质优价廉的国际教材。

祝愿我国的管理教育事业在社会各界的大力支持和关心下不断发展、日进日新；祝愿我国的经济建设在不断涌现的大批高层次的面向国际市场竞争、具备国际经营头脑的管理者的勉力经营下早日中兴。

赵纯均 教授

清华大学经济管理学院院长  
全国工商管理硕士教育指导委员会副主任

# PREFACE

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When I wrote the first edition of *Environmental and Natural Resource Economics* in 1981, environmental and natural resource economics was a well-developed, but underutilized, field. Its impact on environmental policy could most generously be described as “emerging.” That is no longer the case. Economics has become an indispensable part of the education of anyone dealing with environmental policy. As *Our Common Future* put it in 1987, “Economics and ecology bind us in ever-tightening networks. . . . Economics and ecology must be completely integrated in decision-making and law-making processes.”<sup>1</sup>

Signs of maturation abound. A number of journals are now devoted either exclusively or mostly to the topics covered in this book. One, *Ecological Economics*, is a journal dedicated to bringing economists and ecologists closer together in a common search for appropriate solutions for environmental challenges. Interested readers can also find advanced work in the field in *Land Economics*, *Journal of Environmental Economics and Management*, *Environmental and Resource Economics*, *Resource and Energy Economics*, and *Natural Resources Journal*, among others.

New resources for student research projects have been made available in response to the growing popularity of the field. Original research on topics related to international environmental and natural resource issues was formerly very difficult for students because of the paucity of data. A number of good sources now exist, including *World Resources* (Washington, DC: Oxford University Press, published annually), which has an extensive data appendix, and *OECD Environmental Data* (Paris: Organization for Economic Cooperation and Development, published periodically).

Three Internet sources will be mentioned because they are so closely related to the focus of environmental and natural resource economics. Two discussion lists that involve material covered by this book are RES-ECON and ECOL-ECON. The former is a more academically inclined list focusing on problems related to natural resource management, whereas the latter is a more wide-ranging discussion list dealing with sustainable development.

Services on the Internet are changing so rapidly that some of this information may become obsolete. One way to keep up to date on the various web options is to visit my web site at <http://www.colby.edu/personal/thtieten/>. That site has links to other sites, including the site sponsored by the Association of Environmental and Resource Economists, which has information on graduate programs in this field.

*Environmental and Natural Resource Economics* attempts to bring those who are beginning the study of environmental and natural resource economics close to the frontiers of knowledge. Although it is designed to be accessible to students who have completed only a two-semester introductory course in economics or a one-semester

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<sup>1</sup>The World Commission on Environment and Development, *Our Common Future* (New York: Oxford University Press, 1987): 27, 37.

introductory microeconomics course, it has been successfully used in several institutions in lower-level and upper-level undergraduate courses as well as lower-level graduate courses.

Intertemporal optimization is handled within a discrete-time, mathematical programming framework, and all mathematics other than simple algebra are relegated to appendixes. Graphs and numerical examples are used to provide an intuitive understanding of the principles suggested by the math and the reasons for their validity. In the fifth edition I have tried to retain the strengths that seem particularly valued by users, while expanding the number of applications of economic principles, clarifying some of the more difficult arguments, and updating the material to include the very latest developments around the world.

The structure and topical coverage of this book facilitate its use in a variety of contexts. For a survey course in environmental and natural resource economics, all chapters are appropriate, though many of us have found that the book contains somewhat more material than can be covered adequately in a quarter or even a semester. This surplus of material provides some flexibility for the instructor to choose those topics that best fit his or her course design. A one-term course in natural resource economics could be based on Chapters 1 to 14 and 22 to 24. A brief introduction to environmental economics could be added by including Chapter 15. A single-term course in environmental economics could be structured around Chapters 1 to 5 and 15 to 21. Chapter 7 could be added if a brief introduction to natural economics seems desirable.

## NEW TO THIS EDITION

The fifth edition continues the trend started in the last edition toward a more international focus. Additional attention has been paid to environmental problems and policies in Eastern and Western Europe, China, and the developing nations than was the case in previous editions. Economic valuation of the environment is now addressed with two chapters, rather than one. While the first deals with the concepts that lie behind economic valuation, the second focuses on measurement concepts. Both chapters contain several practical illustrations.

The introductory material on sustainable development now appears in a separate chapter; new mathematical appendices have been added for the fisheries and forestry chapters; and a new glossary of terms defines and explains over 200 terms.

New boxed examples highlight special topics, including: (1) Does Reducing Pollution Make Economic Sense? (2) Choosing Between Preservation and Development in Australia; (3) Valuing Damage from Groundwater Contamination Using Averting Expenditures, (4) Valuing Diesel Odor Reduction by Contingent Ranking; (5) The Value of Wildlife Viewing; (6) Income-Generating Activities as Fertility Control: Bangladesh; (7) Implementing the "Take-Back" Principle; (8) Trust Funds for Habitat Preservation; (9) Free-Access Harvesting of the Minke Whale; (10) Local Approaches to Wildlife Protection: Zimbabwe; (11) Environmental Taxation in China; (12) The Sulfur Allowance Program; (13) Why and How Do Environmentalists Buy Pollution? (14) Tradeable Permits for Ozone-Depleting Chemicals; (15) Car Sharing: Better Use of Automotive Capital; (16) Getting the Lead Out: The



Lead Phaseout Program; (17) Counterproductive Policy Design; (18) Jobs Versus the Environment: What is the Evidence; (19) Resource Depletion and Economic Sustainability: Malaysia; (20) Controlling Land use Development with TDRs; and (21) Reputational Strategies for Pollution Control in Indonesia.

New topics covered include:

- electricity deregulation
- Web sites of interest
- The relative costs of risk reduction options
- Environmental Kuznets curves
- Averting expenditures
- Contingent ranking
- Disclosure strategies
- Kyoto Protocol and emissions trading of greenhouse gases

Some complete new data and artwork have been added.

This edition retains a strong policy orientation. Though a great deal of theory and empirical evidence is discussed, their inclusion is motivated by the desire to increase understanding of intriguing policy problems, and these aspects are discussed in the context of those problems. This explicit integration of research and policy within each chapter avoids the problem frequently encountered in applied economics textbooks—that is, in such texts the theory developed in earlier chapters is often only loosely connected to the rest of the book. The many insights gleaned from other disciplines have an important role to play in overcoming the typical textbooks' tendency to accept the material uncritically at a superficial level; instead, this text highlights those characteristics that make the economics approach unique.

This is an economics book, but it goes beyond economics. Insights from the natural and physical sciences, literature and political science, as well as other disciplines, are scattered liberally throughout the text. In some cases these references raise unresolved issues that economic analysis can help resolve, while in others they affect the structure of the economic analysis or provide a contrasting point of view. They have an important role to play in overcoming the tendency to accept the material uncritically at a superficial level by highlighting those characteristics that make the economics approach unique.

## ACKNOWLEDGMENTS

Perhaps the most rewarding part of writing this book has been that it has put me in touch with so many thoughtful people I had not previously met. I very much appreciate the faculty and students who pointed out areas of particular strength or areas where coverage could be expanded in this edition. The support this book has received from faculty and students has been gratifying and energizing. One can begin to understand the magnitude of my debt to my colleagues by glancing at the several hundred names in the lists of references contained in the name index. Because their research contributions make this an exciting field, full of insights worthy of being shared, my task was easier and a lot more fun than it might otherwise have been.

Valuable assistance was received during various stages of the writing from the following:

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